THE ESCALATION OF GREAT POWER MILITARIZED DISPUTES: TESTING RATIONAL DETERRENCE THEORY AND STRUCTURAL REALISM

PAUL HUTH and CHRISTOPHER GELPI *University of Michigan*
D. SCOTT BENNETT *State University of New York, Buffalo*

Realism has been the dominant paradigm in the study of international conflict. Within this paradigm, two leading alternative approaches have been deterrence theory and structural realism. We test the relative explanatory power of these two theoretical approaches on the escalation of deterrence encounters among great powers from 1816 to 1984. We derive a set of hypotheses from each model, operationalize them for systematic empirical analysis, and test the hypotheses on 97 cases of great-power deterrence encounters by means of probit analysis. The results are that the hypotheses derived from deterrence theory receive considerable support, whereas none of the hypotheses derived from structural realism are supported.

In contemporary research on the causes of international conflict, the realist paradigm has been the dominant theoretical approach. Within this broad framework, however, scholars have developed at least two prominent alternative models of the conditions under which conflict is likely to arise. The first approach, structural realism,[1] focuses on the attributes of the international system while the second, deterrence theory, is largely dyadic and emphasizes the resolve and relative military capabilities of adversarial states. While both theoretical approaches attempt to identify the conditions under which international crises and wars are likely to arise, their critical difference lies in the variables they argue to be the most important in determining the decisions of state leaders. More specifically, the two models emphasize variables from different levels of analysis. We shall test the relative explanatory power of variables from these two models in predicting the escalation of militarized disputes among great powers.

Many scholars have empirically tested systemic theories of conflict behavior. (For a listing of relevant works, see Huth, Bennett, and Gelpi 1992, 479.) Taken as a whole, however, these studies have not identified a robust empirical relationship between system structure and international conflict. One possible reason for the lack of clear findings is that these studies have not properly specified the theoretical connection between system structure and the decisions of policymakers at the state level. In a previous paper, we specified that connection and found that system structure had a significant impact on great-power militarized dispute initiation (Huth, Bennett, and Gelpi 1992).

In contrast to most quantitative research on system structure, a number of empirical studies have lent support to the explanatory utility of deterrence theory (e.g., Bueno de Mesquita 1981a; Huth 1988; Mearsheimer 1983; Wu 1990). One possible reason is that deterrence theory has not suffered as acutely from the problem of underspecification, since it is focused at the decision-making level of analysis. However, one important shortcoming of these empirical studies is that they have not tested deterrence theory against structural realism, its prominent competitor.

Drawing on our previous work (Huth, Bennett, and Gelpi 1992), we shall establish a clear logical connection between system structure and the decisions of state leaders. We shall test this model against a simple deterrence model to see which one provides greater explanatory power. Our more complete model of system structure builds upon the work of Bueno de Mesquita (1978, 1981), who has argued that system structure relates to conflict escalation through its interaction with the risk propensities of decision makers. In contrast to our previous findings regarding dispute initiation, in this study we find—in opposition to much of conventional wisdom but consistent with the argument we develop—that even when properly specified the structural realist model has *no significant* explanatory power with regard to the escalation of conflicts between great powers. Deterrence theory, on the other hand, provides *substantial* insight.

First, we define the concepts that are central to our theoretical models and formulate hypotheses derived from both structural realism and rational deterrence theory. Then we discuss the research design for testing the model and the operationalization of the variables and present the results of our empirical tests. Finally, we consider the theoretical and policy implications of our findings.

DEFINITION OF CONCEPTS

Structure of the International System

A self-contained system can be thought of as a set of interacting and interdependent units. Both the ordering of the units according to power resources and the density and arrangement of linkages among those units determine the structure of a system. This structure, in turn, may give rise to conditions that result in

recurring patterns of unit behavior. The application of this general definition has created some disagreement among scholars concerning what specific features comprise the structure of the international system. We shall present the range of debate regarding this issue and test the empirical utility of various operational definitions of system structure.

We have identified six differing conceptions of system structure in the literature. The narrowest conception of system structure is that of Kenneth Waltz (1979), who asserts that we should distinguish between international systems according to the number of great powers. In fact, he narrows his definition further to argue that the only important distinction is between systems with two great powers (bipolar) and those with four or more great powers (multipolar).[2] William Thompson (1988), however, argues that the distribution of capabilities among great powers is important, in addition to their number. Furthermore, some scholars argue that alliance coalitions are also important in shaping structural incentives for conflict (e.g. Deutsch and Singer 1964). Additionally, if one accepts the distributional logic presented by Thompson as well as Deutsch and Singer's assertion that alliance groups represent important systemic actors, then the distribution of capabilities among alliance coalitions should also be a systemic variable. Finally, some scholars have argued that the degree of cross-cutting ties between alliance blocs should also be considered an aspect of system structure (Bueno de Mesquita 1975; Deutsch and Singer 1964).

Given our general definition of system structure, we see no logical reason to exclude any of these alternative components of system structure, and so we shall consider all of them. Furthermore, in the face of such disagreement it is important to test for the robustness of our results.

System Uncertainty

System uncertainty is conceptualized as the confidence that decision makers have in their estimates of the expected outcome of an armed conflict resulting from characteristics of system structure. The level of system uncertainty refers to the amount of variance around a decision maker's estimate of an outcome—win, lose, or draw.[3] It follows that when system uncertainty is low, decision makers will be relatively sure about what the outcome of an armed confrontation will be. Conversely, when system uncertainty is high, decision makers will find the outcome more difficult to predict. System uncertainty is necessarily a perceptual variable, but some of the uncertainty that decision makers experience is a direct function of the structural attributes of the international system.[4] We shall develop the relationship between system structure and system uncertainty in the next section.

Risk Propensity

Risk propensities reflect the fact that different individuals may choose differently because of their attitudes toward options with probabilistic outcomes.[5] 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 (Luce and Raiffa 1957).[6]

We believe that there are two important sources of risk attitudes: individual and situational. In the former, personality characteristics predispose individuals to take or avoid risks. In the latter, risk attitudes vary with the situational context in which decisions are made (see, Kahneman and Tversky 1979; Quattrone and Tversky 1988). Specifically, when individuals frame their choice of options from the perspective of trying to avoid losses, they are likely to be risk-acceptant. Conversely, when the options are viewed as an opportunity to make gains, individuals will be risk-averse.[7]

Deterrence

We define deterrence as a "policy that seeks to persuade an adversary, through the threat of military retaliation, that the costs of using military force will outweigh the benefits" (Huth 1988, 15). In a situation of immediate deterrence, a challenger is *actively* considering the use of military force, and the target counters with a threat of military retaliation. Deterrence may be undertaken either in defense of a state's own territory (direct immediate deterrence) or that of another country (extended immediate deterrence).

THEORETICAL MODELS AND HYPOTHESES

In our theoretical models of system structure and deterrence, we present in simplified form the key variables expected to shape the decisions of a challenging state that is considering whether to escalate a dispute and risk an armed conflict. Each model assumes that states behave as unitary rational actors. That is, each argues that the leader in the challenging state chooses between accepting the status quo and escalating a conflict based on the expected value of armed conflict versus the payoff expected from the status quo.[8] Once again, the important difference between the approaches lies in the variables they argue to be salient in leaders' cost–benefit calculations.

Conflicts of interest between states rarely lead directly to war. More often, interstate disputes escalate to the outbreak of war in two stages: the initiation of a militarized dispute and the escalation of that dispute into a war. Logically, both system structure and the deterrent policies of states should be relevant at each stage of this escalatory process. We define militarized dispute initiation as the movement from peaceful competition between adversaries to an attempt by one state to overturn the status quo by

coupling demands with threats of force. If the challenge is resisted and an international crisis emerges, then the analysis shifts to militarized dispute escalation. At this stage, decision makers must choose whether to stand firm and resort to the use of force to secure their interests or back down in order to avoid the costs of war. In previous works, we have analyzed the first stage of this escalatory process (Huth, Bennett, and Gelpi 1992; Huth and Russett 1993). Here, we shall focus on the second stage.

The study of escalation can only follow the initiation of a militarized dispute. As a result, challenging states select themselves into our population of study, making it important to consider the effects of this selection process on our theoretical and empirical analyses. Generally, we expect that relatively resolved states will be selected into our population. Such resolved states will be more likely to escalate disputes regardless of the deterrent policies of its adversary or the effects of system uncertainty. The implications of this selection process for our empirical analysis is that in both models, positive coefficients should be biased downward, while negative coefficients should be biased upward (Achen 1986).[9] However, as long as one does not try to generalize beyond the particular stage of the selection process under analysis, we think it is misleading to speak of this effect as selection bias within our study. Our estimates *do* accurately reflect the influence of the different variables at *this stage* of the selection process.

Structural Realist Hypotheses

Wars are initiated by state leaders, so if system structure is to affect conflict behavior, it must do so through its effects on decision makers. Structure provides information to leaders about the expected outcome of an armed conflict. Some systemic conditions lead state leaders to be more confident in their predictions of conflict outcomes, whereas others force them to be less confident. As a result, at the core of the structural realist perspective is the link between decision makers' uncertainty created by the structure of the system and decision makers' willingness to engage in conflictual behavior. We assume that leaders do not have perfect theories explaining the conflict behavior of other states and that therefore, decisions regarding the escalation of a conflict will always be made in the face of uncertainty. When leaders must make decisions in an uncertain environment, their propensity to take risks will necessarily shape their behavior. In particular, the effects of system uncertainty will be mediated by decision makers' risk-taking propensities.[10] When system uncertainty is high, risk-acceptant decision makers will gamble by pursuing policies that run the risk of provoking armed conflict. Risk-averse decision makers, however, will be cautious regarding the escalation of disputes when faced with high levels of uncertainty. Thus uncertainty should have *opposite* effects on a state's escalatory behavior, depending upon the risk propensity of its leaders.

In order to move from this general argument to specific testable propositions about conflict behavior, we must apply this argument to each of the six conceptions of system structure identified earlier. First, we will address the conceptions of structure that focus on the number of actors in the international system, that is, Waltz's division between bipolar and multipolar systems, the number of great powers, and the number of alliance coalitions. As the number of actors in the system increases, it becomes more difficult to predict the outcome of an armed conflict since state leaders must correctly predict the behavior of many independent actors. For example, the opposing incentives arising from the problems of collective action and entrapment complicate decision makers' ability reliably to predict which actors will support or oppose them (Christensen and Snyder 1990; Snyder 1984; Waltz 1979). As a result, decision makers will be less confident in predicting international responses to their escalation of a conflict. Combining these variables with the risk propensities of national leaders, we develop the following three hypotheses:

HYPOTHESIS 1. *In a multipolar system, a risk-acceptant decision maker will be more likely to escalate a militarized dispute than in a bipolar system. In contrast, in a multipolar system a risk-averse decision maker will be less likely to escalate a conflict than in a bipolar system.*[11]

HYPOTHESIS 2. *As the number of great powers increases, risk-acceptant decision makers will be more likely to escalate a militarized dispute. In contrast, as the number of great powers increases, risk-averse decision makers will be less likely to escalate a conflict.*

HYPOTHESIS 3. *As the number of great-power alliance coalitions increases, risk-acceptant decision makers will be more likely to escalate a militarized dispute. In contrast, as the number of great-power alliance coalitions increases, risk-averse decision makers will be less likely to escalate a conflict.*

Next, we consider the conceptions of system structure that focus on the distribution of capabilities among individual great powers and among great-power alliance coalitions. As military capabilities become more evenly distributed, decision makers become less certain of their predictions regarding the outcome of an armed conflict because these outcomes are highly sensitive to errors in estimating the response of other actors. Given any number of great powers, an equal distribution of capabilities creates more uncertainty than does a skewed one. For example, if there are two actors, an even distribution (50–50) leaves greater uncertainty about the outcome of a conflict than does a more unequal (70–30) distribution. Similarly, if there are four actors, an equal division of capabilities (25–25–25–25) creates more uncertainty than a less even (55–15–15–15) division. In the latter case, one need only predict the actions of the dominant power in order to project the outcome of an armed confrontation. In the first case, however, mispredicting the behavior of any of the great powers could have significant consequences. Combining this

argument with the intervening effects of risk propensity produces the following hypotheses:

HYPOTHESIS 4. *As capabilities become more evenly distributed among the great powers, risk-acceptant decision makers will be more likely to escalate a militarized dispute. In contrast, as capabilities become more evenly distributed among the great powers, risk-averse decision makers will be less likely to escalate a conflict.*

HYPOTHESIS 5. *As capabilities become more evenly distributed among great-power alliance coalitions, risk-acceptant decision makers will be more likely to escalate a militarized dispute. In contrast, as capabilities become more evenly distributed among great-power alliance coalitions, risk-averse decision makers will be less likely to escalate a conflict.*

Finally, we consider the conception of system structure that includes the extent of alliance ties crossing coalition boundaries. As the number of cross-cutting ties in the system increases, it becomes more difficult to predict other states' behavior. The more links a particular state has with an opposing alliance coalition, the lower the reliability of its support for members of its own coalition, because its security interests are divided between coalitions. Combining this variable with risk propensity produces our final structural-realist hypothesis:

HYPOTHESIS 6. *As the extent of cross-cutting ties between great-power alliance coalitions increases, risk-acceptant decision makers will be more likely to escalate a militarized dispute. In contrast, as the extent of cross-cutting ties increases, risk-averse decision makers will be less likely to escalate a conflict.*

In previous work, we have found that system uncertainty does appear to affect the *initiation* of militarized disputes in the manner discussed (Huth, Bennett, and Gelpi 1992). We believe, however, that this effect will be attenuated with regard to the *escalation* of disputes to war. When decision makers are considering the initiation of a militarized dispute, many states have not taken any public position with regard to the particular challenge that may be offered. Although leaders have some general idea of who is likely to align with whom, it remains relatively unclear whether states not directly involved in the challenge will take an active role in the dispute. Consequently, the level of system uncertainty is likely to be salient to national leaders in such situations. When deciding whether to *escalate* a dispute, however, decision makers are generally able to gather a number of *behavioral* cues that reduce the influence of system uncertainty. Once a challenge has been issued, all great powers, including those not directly targeted, must choose some sort of response to this action, even if they choose to remain uninvolved. As a result, leaders of the challenging state will have a much clearer conception of who is likely to oppose them in case of an armed conflict. States that fail to respond with any counterthreats may be disregarded. The challenger can therefore focus its attention on the states that have threatened to resist with force. Thus structural variables such as the number of great powers and the distribution of capabilities among them may be less relevant to state decisions once leaders are more certain of who is willing to use force to resolve a particular dispute. One implication of this argument is that although we previously found systemic factors to be an important influence on dispute initiation, we should not be surprised to find the substantive and statistical impact of the systemic variables discussed in hypothesis 1–6 to be reduced in this study.

Hypotheses from Rational Deterrence Theory

Consistent with the realist framework, rational deterrence theory also argues that the challenger weighs the costs and benefits of escalating the dispute to the point of armed conflict versus accepting the status quo (e.g., Bueno de Mesquita 1981; Ellsberg 1961; George and Smoke 1974; Jervis 1984; Powell 1990; Schelling 1960, 1966; Snyder 1961; Wagner 1982; Wu 1990; Zagare 1987). In order for deterrence to succeed, the challenger's expected utility for accepting the status quo must be greater than its expected utility for attempting to overturn the status quo through the use of force. This condition is commonly represented in the deterrence literature by the following relationship:

$$\text{Value of status quo} > P(\text{win}) * \text{value of victory} + [1 - P(\text{win})] * \text{value of defeat.}$$

Deterrence theory argues that the credibility of threats is the primary determinant of deterrence success or failure: the more credible the threat, the more likely deterrence will succeed. A credible threat implies that the deterring party has the military capabilities to impose high costs on a challenger and that the challenger perceives that the deterring party is willing to do so. As a result, credibility is a function of two central variables: the balance of military capabilities between challenger and defender and the challenger and defender's level of resolve. The balance of capabilities influences the challenger's probability of victory as well as the value it places on a victory or defeat on the battlefield. As the balance of military capabilities shifts toward the challenger, it becomes more likely that it will be able to prevail in an armed conflict. Additionally, under these circumstances the costs of armed conflict decline, increasing the net utility of a victory on the battlefield. The challenger and defender's resolve is a function of the value placed on victory, defeat, and the status quo. For example, as the challenger places a larger value on victory relative to the value of the status quo, it becomes more resolved to use force.

Deterrence theory has been developed by many scholars over the past several decades. Each of these scholars emphasizes some of their own particular aspects of direct or extended deterrent situations, but at the core of these alternative theory-building efforts is a common set of explanatory variables. While there

is value in developing more precise formulations of the deterrence model, our purpose here is to test the general explanatory power of the deterrence approach relative to that of structural realism. Thus we restrict our attention to a set of core variables in a deterrence model. Drawing heavily on the deterrence literature, we have identified five common variables: (1) the balance of conventional military capabilities, (2) the defender's possession of nuclear weapons, (3) challenger's and defender's interests at stake in the dispute, (4) challenger's and defender's involvement in other disputes, and (5) the past dispute behavior of challenger and defender. We now derive hypotheses regarding the effects of each of these variables by relating them to the challenger's expected utility calculation whether to escalate a militarized dispute.

Balance of Conventional Military Capabilities. The balance of military forces between challenger and defender is one of the most basic components of the deterrence approach. Analysts may disagree about how to measure the balance or how strong the effects of the balance may be relative to other factors, but without the inclusion of the balance of capabilities, it is hard to conceive of a model as a "deterrence" model.[12] As the conventional military capabilities of the challenger improve relative to those of the target, the costs of armed conflict decrease and the probability of victory increases. As a result, the challenger may attempt to exploit that military advantage either to coerce the defender into making concessions or to impose a change in policy through victory on the battlefield. These capabilities must take into account both the probable support or opposition of other states involved in the dispute and those states' distance from the location of the dispute.

HYPOTHESIS 7. *The more favorable the balance of military capabilities for the challenger, the higher the probability that it will escalate a militarized dispute against the defender.*

Defender's Possession of Nuclear Weapons. The literature on the deterrent value of nuclear weapons is enormous and draws many nuanced distinctions between the effects of various nuclear environments and strategies (Glaser 1990). Perhaps the central assertion that can be drawn from this literature, however, is that the possession of a secure second-strike capability by the defender drives the value that the challenger places on defeat down sharply, increasing the likelihood of deterrence success (e.g., Glaser 1990; Jervis 1984; Zagare 1987). Additionally, the use of nuclear weapons may also decrease the challenger's likelihood of success on the battlefield, which also increases the prospects for deterrence success.

HYPOTHESIS 8. *If the defender possesses a second-strike nuclear capability, the probability that the challenger will escalate a militarized dispute against the defender will decrease.*[13]

Interests at Stake for Challenger and Defender. As the interests at stake in a dispute increase for each of the two parties, the value that they place on prevailing in an armed conflict increases as well. Additionally, as the challenger's and defender's interests at stake in the crisis increase, the relative value that the challenger places on the status quo will decrease, while the defender's utility for the status quo will increase (Betts 1987; George and Smoke 1974; Jervis 1984; Morgan 1990; Morrow 1989). Geographically proximate states are of strategic value since they can act as defensive buffers against external security threats or can be used as bases from which to project military power for offensive purposes. Additionally, in the nineteenth and early twentieth centuries, state elites often considered colonial territories to be of vital importance. Thus states will be more willing to use force in disputes concerned with these vital areas. The hypothesis regarding the challenger's interests at stake, therefore, is as follows:

HYPOTHESIS 9. *When a militarized dispute involves the control of territory that the challenger considers to be part of its national or colonial territory or a state adjacent to that territory, the challenger will be more likely to escalate the dispute.*

A challenger will also be aware that this same logic applies to the behavior of the target state. As a result, the challenger will realize that the target is highly motivated to defend areas near its own vital interests. The hypothesis regarding the defender's interests at stake, therefore, is as follows:

HYPOTHESIS 10. *When a militarized dispute involves the control of territory that the target considers to be part of its national or colonial territory or a state adjacent to that territory, the challenger will be less likely to escalate the dispute.*

Past Behavior of Challenger and Defender. In deterrence theory the bargaining reputation of states is of central concern. A state's determination to stand firm in a crisis is a function both of contextual factors (e.g., the balance of forces) and the state's independent willingness to use force if necessary. A state's reputation for resolve captures this independent willingness to stand firm. If a state backs down during a crisis, it does so knowing that it is doing damage to its bargaining reputation. Since states have no strategic incentive to back down in crises (i.e. there is no reason to "bluff" capitulation), backing down sends a reliable and revealing message that the state is, in fact, weakly resolved.[14] As a result, state leaders should perceive the defeat of their adversary in a previous dispute as an indication of general weakness on their part (Nalebuff 1991; Powell 1990; Schelling 1966). Challengers should conclude that the time is now favorable for confronting their opponent and resolving any dispute to their advantage. The defender, of course, should draw similar inferences about the resolve of the challenger based on its previous dispute behavior.

HYPOTHESIS 11. *If the defender backed down in a previous dispute, the likelihood that the challenger will escalate the current dispute will increase.*

HYPOTHESIS 12. *If the challenger backed down in a previous dispute, the likelihood that the challenger will escalate the current dispute will decrease.*

Current Dispute Behavior of Challenger and Defender. Finally, one variable that we believe should be an important part of any deterrence model is the current dispute involvement of the parties. This variable has received little attention in the traditional deterrence literature—perhaps because it yields few policy implications for the behavior of the defender. Yet involvement in other conflicts clearly has a direct impact on the diplomatic and military resources that a state can direct to the dispute at hand. As a result, this variable should be as much of a basic component of a deterrence model as the other variables we have discussed. If a state's diplomatic and military resources are committed to one dispute, then it is less likely that the state will be in a favorable position to prevail in additional disputes with other states. This logic applies to both the challenger and the defender.

HYPOTHESIS 13. *Challenger involvement in a militarized dispute or war with a third state leads to a lower probability that the challenger will escalate a militarized dispute against the defender.*

HYPOTHESIS 14. *Defender involvement in a militarized dispute or war with a third state leads to a higher probability that the challenger will escalate a militarized dispute against the defender.*

RESEARCH DESIGN AND MEASUREMENT OF VARIABLES

Population of Cases

We will test our hypotheses on the population of great-power extended and direct immediate deterrence encounters from 1816 to 1984. Following Small and Singer (1982) and Levy (1983) we identify the great powers between 1816 and 1984 as follows:

Great Britain 1816–1945
France 1816–1940
Russia/Soviet Union 1816–1984
Austria–Hungary 1816–1918
Prussia/Germany 1816–1945
Italy 1860–1943
United States 1899–1984
Japan 1895–1945
China 1950–1984

A great-power deterrence encounter is defined by the explicit verbal threat of force or the movement and buildup of military forces in preparation for armed conflict by a challenging great power and a counterthreat by the defending great power (Huth 1988). A challenger initiates a dispute by coupling a demand with a threat of force, which is then resisted with a retaliatory threat by a great-power target. In a direct immediate deterrence case, the challenger's threat is targeted at the homeland of the great-power defender, whereas in extended immediate deterrence cases the initial threat of the challenger is aimed at a minor power.[15] The list of cases is presented in the Appendix.[16]

Measurement of Variables

Dispute Escalation. We define dispute escalation as the failure of the deterrent policies of the great-power defender (Huth 1988). Deterrence may fail in one of two ways: the challenger may resort to the large-scale use of military force, or the defender may capitulate to the demands of the challenger regarding the central issues at stake in the dispute under the threat of armed conflict.[17] Deterrence success, on the other hand, is defined as the challenger's failure to use force combined with its inability to coerce the defender to make concessions on the essential issues at stake in the dispute.[18] The codings for the individual cases of deterrence success and failure are listed in the Appendix.

System Uncertainty. As discussed earlier, we use six different indicators to operationalize system uncertainty: (1) bipolar versus multipolar systems, (2) the number of great powers, (3) the diffusion of military capabilities among the great powers, (4) the number of great-power alliance clusters, (5) the diffusion of capabilities across clusters, (6) the level of alliance ties that cross cluster boundaries. We have coded each of these variables so that larger values correspond to higher levels of system uncertainty. We shall limit ourselves here to a relatively brief description of the coding procedures. (For a detailed discussion of each of the operational indicators, see Huth, Bennett, and Gelpi 1992.)

1. *Bipolarity versus multipolarity.* This indicator is coded as a dummy variable. It is coded 1 when Waltz (1979) identifies the system as multipolar (1816–1945), and 0 when he argues that it is bipolar (1946–84).
2. *Number of great powers.* The number of great powers in the international system is derived from the list just given.
3. *Diffusion of capabilities across great powers.* The military capabilities of each state are measured by averaging total manpower, military spending, and spending per soldier as a percentage of the total capabilities of the great powers during each year in which there is a dispute (spending per soldier is taken as a very rough measure of the quality of the troops).[19] We then use an index in order to measure how concentrated these aggregate capabilities are among the great powers (Singer, Bremer, and Stuckey 1972). An index score of 1 reflects maximum concentration of capabilities, while 0 reflects an even distribution. We then convert the concen-

tration of capabilities into the diffusion of capabilities by setting diffusion equal to 1 minus the concentration index, so that a higher value corresponds to greater system uncertainty.

4. *Number of great-power alliance clusters.* Drawing on Bueno de Mesquita (1975), we use tau_b (an ordinal measure of association varying from −1, indicating an opposite pattern, to 1, indicating complete similarity) to measure the similarity of alliance commitments between the great powers. These tau_b "similarity scores" are taken to reflect the level of shared interests between states. We then use typal analysis (McQuitty 1957) to group states into clusters based on this alliance similarity. As a result, alliance clusters are characterized by states sharing relatively high tau_b similarity scores with one another. That is, they tend to share alliance ties with one another and/or with common third states.
5. *Diffusion of capabilities across clusters.* We also utilize the converted concentration index in order to determine the diffusion of capabilities among alliance clusters. Since it is not certain that an ally will come to the aid of one of its partners in a crisis, we discount the aggregate capabilities of a cluster by the level of alliance-similarity scores within that cluster, which we take to reflect shared interests. As a result, each cluster's capabilities are discounted by the level of alliance tightness among its members. The tightness of a cluster is defined as the average of the similarity scores of each pair of its members (Bueno de Mesquita 1975).
6. *Cross-cutting alliance ties between clusters.* Our measure of cross-cutting alliance ties is calculated as the average of all intercluster alliance-pattern similarity scores. However, this variable ranges from −1 to 1, making its interpretation in interaction with risk propensity difficult to sort out. As a result, we add a constant of 1 to simplify the interpretation of this variable.

In testing for the robustness of our results concerning system uncertainty, we shall include these various measures in differing combinations with one another. In order to test a comprehensive model of system uncertainty that includes the broadest range of indicators, high levels of multicolinearity forced us to combine indicators two through six into a composite measure of system uncertainty through the use of factor analysis.[20] The use of factor analysis is quite appropriate in this case because our separate indicators are all measuring some aspect of a single concept—system uncertainty. System uncertainty factor 1 (system size) is composed primarily of the number of major powers in the system, the number of alliance clusters, and the average level of alliance similarity across these clusters. System uncertainty factor 2 (capability diffusion), on the other hand, is composed almost exclusively of the concentration of capabilities across great powers and alliance clusters.

Risk Propensity. Our measure of risk propensity includes both individual and situational components. We identify three sources of risk acceptance, and if *any two* are present, we code the decision makers in that state as risk-acceptant. Because of the limited data available for coding this variable, we believe that it would be a mistake either to code the variable on the basis of a single indicator or require that all three indicators converge.

Our three indicators of risk propensity are indirect in the sense that they focus empirically on states' relative capabilities, alliance behavior, and domestic unrest. This may raise some concerns because we move from such broad measures to the attitudes of individual decision makers (Levy 1992). It is important to remember, however, that we are working with the realist assumption that states behave as unitary rational actors. Consequently, we do not face the problem of aggregating the differing risk propensities of various decision makers within a state. Without doubt, this unitary actor receives advice from many sources. However, we assume that the final decision regarding conflict escalation is the responsibility of a single dominant leader. Additionally, we assume that this decision maker's risk propensity is shaped by his or her role as a domestic political leader seeking to maintain a hold on office and as the decision maker ultimately responsible for his or her country's national security. As a result, our indicators of risk propensity attempt to tap a state's external security environment and the leader's level of domestic political support.

We realize fully that these indicators are crude and indirect at best. Nonetheless, similar measures have been used successfully in empirical research in international politics. Bueno de Mesquita (1981a, 1985, 1992), for example, has effectively used his indicator in several different works. Indicators derived from prospect theory have been fruitfully applied, as well (Farnham 1992; McDermott 1992; McInerney 1992). Finally, we have successfully used our indicator of risk propensities in previous work on great-power conflict initiation (Huth, Bennett, and Gelpi 1992).

The first aspect of risk propensity that we identify is Bueno de Mesquita's (1981) measure of individual risk propensity, which is calculated using a state's expected utility for conflict. If a state has a positive expected utility against fewer great powers than have positive utility against it, it is coded as 1 (risk-acceptant) and 0 otherwise.[21] Our second and third risk factors emerge from prospect theory, which argues that decision makers who perceive themselves to be in the domain of losses are likely to be risk-acceptant (Kahneman and Tversky 1979; Quattrone and Tversky 1988). We argue that decision makers will perceive themselves to be in the domain of losses or gains based on two variables—the relative industrial–military position of their country compared to the defender and the domestic political conditions within their country. The four indicators we use to capture these two variables are as follows:

1a. *Relative industrial growth.* An index of production incorporating industries that provide a critical base for military capabilities has been constructed for each great power.[22] We calculated three-year moving averages, and if the challenger's moving-average growth rate is lower than the defender's, then a value of 1 is coded, and 0 otherwise.

1b. *Relative military growth.* Three-year moving averages have been calculated for the annual growth of manpower, military spending, and spending per soldier. If the challenger's moving-average figure is lower than the defender's, a value of 1 is coded, and 0 otherwise.

2a. *Economic growth.* Our measure of economic growth compares the challenger's current growth rate with a three-year moving average. If the current year's rate is 50% or more below the moving average, then a value of 1 was coded, and 0 otherwise.

2b. *Strike activity.* The challenger's current number of strikes and labor days lost are compared to a three-year moving average. If either the number of strikes or the labor days lost due to strikes in the current year is 50% higher than the moving average, then a 1 is coded, and 0 otherwise.

Once again, in order to be coded as risk-acceptant, a challenger must meet any two of three conditions: (1) a low expected utility for conflict, (2) poor military or industrial growth relative to the *defender*, and (3) low levels of economic growth or high levels of strike activity relative to *its own* recent levels. We interact this indicator of risk propensity with each of the various indicators of system structure. The coefficients on the system uncertainty measures alone represent the effects of the system on risk-averse actors, while the coefficients on the system uncertainty measures interacted with risk propensity represent the additional effects of the system on risk-acceptant states. So as not to constrain all actors in the system to have an equal probability of conflict initiation at the lowest level of system uncertainty, we also include risk propensity by itself. Our expectation would be that this variable will have a positive coefficient.

Balance of Conventional Military Capabilities. This variable is a ratio comparing the capabilities of the challenger(s) to the total capabilities of the challenger(s) and defender(s), as identified in the Appendix. Individual states' capabilities are measured as discussed previously, with the addition that they are discounted for the distance either to the point of dispute or to the territory of the nearest opposing great power, whichever distance is shorter. The effect of distance on states' ability to project military power is calculated as described by Bueno de Mesquita (1981a).

Defender Possession of Second Strike Nuclear Capability. This variable is coded 1 if the defender possesses the capability to deliver nuclear weapons onto the population of the challenger following the absorption of a nuclear first strike, and 0 otherwise (Arkin and Fieldhouse 1985; Betts 1987).

Interests at Stake for Challenger and Defender. For the defender, this variable is given a value of 1 if the issues at stake in the dispute centered on the control or acquisition of territory adjacent to, or part of, the homeland or colonial empire of the defender. Similarly, for the challenger, we code 1 if the issues at stake in the dispute centered on the control or acquisition of territory adjacent to, or part of, the homeland or colonial empire of the challenger (see Huth, Bennett, and Gelpi 1992).

Past Behavior of Challenger and Defender. The coding procedure for this variable is identical for challenger and defender. In each case, this variable is coded 1 if the state suffered a diplomatic put-down in a dispute with the same opponent within the past 10 years (see Huth 1988).

Current Dispute Involvement of Challenger and Defender. Once again, the coding procedure for this variable is identical for challenger and defender. In each case, this variable was coded 1 if the state was either involved in at least one other militarized dispute within the past six months, or a war with a third party during the current or previous year.[23] The Correlates of War data sets on international and extrasystemic wars and militarized disputes were used to identify involvement in disputes and wars.

DATA ANALYSIS

In order to determine the robustness of our results, we present equations which use five differing operationalizations of system uncertainty, ranging from the narrowest definition of this concept to the most comprehensive. The first equation follows Waltz's conception of system structure; the second focuses on the number of great powers; the third adds the distribution of capabilities among great powers; the fourth shifts its focus to alliance clusters and includes both the number of clusters and the distribution of capabilities among them; and the fifth is a composite of all of these indicators combined in our two factor scores, namely, system size and capability diffusion.[24] In each equation, however, our measurement of the deterrence model remained constant. The results of the probit analysis are presented in Table 1.[25]

The general conclusion that we draw from the results is that rational deterrence theory provides a much more compelling explanation of great-power escalatory behavior than does structural realism. None of the variables from any of the different specifications of the structural realist model are statistically significant in the expected direction. In contrast, seven of the eight estimated coefficients from the deterrence model are in the expected direction in every equation and are statistically significant.

Across the various specifications of the equation,

TABLE 1

Probit Estimates of Effects on Deterrence Outcome across Various Models

VARIABLES	MODEL1	MODEL 2	MODEL 3	MODEL 4	MODEL 5
Constant	−.73 (1.07)	−.95 (1.24)	.35 (3.15)	−.59 (2.32)	−.71 (1.37)
Structural realism					
Multipolar	−.09 (.81)	—	—	—	—
Multipolar × risk-acceptant	−1.79 (.82)**	—	—	—	—
Number of GPs	—	.008 (.16)	.02 (.16)	—	—
Number of GPs × risk	—	−.48 (.20)***	−.51 (.20)***	—	—
Capability diffusion over GPs	—	—	−1.72 (3.86)	—	—
Cap. diff. over GPs × risk	—	—	4.04 (5.08)	—	—
Number of alliance clusters	—	—	—	.33 (.24)*	—
Number of clusters × risk	—	—	—	−.70 (.29)***	—
Cap. diff. over clusters	—	—	—	−2.14 (2.39)	—
Cap. diff. over clusters × risk	—	—	—	1.91 (3.28)	—
System uncertainty 1 (Size)	—	—	—	—	.21 (.32)
System size × risk	—	—	—	—	−.97 (.36)***
System uncertainty 2 (diffusion)	—	—	—	—	−.20 (.24)
System diffusion × risk	—	—	—	—	.18 (.32)
Risk-acceptant	1.38 (.74)**	2.81 (1.23)***	−.18 (3.93)	1.50 (3.27)	1.55 (1.54)
Deterrence theory					
Balance of forces	1.59 (.89)**	1.72 (.90)**	1.69 (.92)**	1.53 (.90)**	1.73 (.94)**
Secure 2d strike	−2.58 (.92)****	−2.59 (.77)****	−2.60 (.78)****	−1.77 (.61)****	−2.33 (.83)****
Defender vital interests	−1.14 (.42)****	−1.30 (.45)****	−1.34 (.46)****	−1.22 (.45)****	−1.29 (.46)****
Challenger vital interests	1.08 (.42)****	1.09 (.42)****	1.09 (.43)****	0.93 (.41)***	1.09 (.44)****
Defender backed down	1.09 (.43)****	1.37 (.47)****	1.36 (.47)****	1.14 (.44)****	1.23 (.46)****
Challenger backed down	−.62 (.54)*	−.66 (.55)*	−.63 (.57)*	−.81 (.56)*	−.72 (.57)*
Defender other dispute	.75 (.39)**	.92 (.39)***	.94 (.39)****	.99 (.41)***	.96 (.42)***
Challenger other dispute	.03 (.37)	−.004 (.36)	−.02 (.37)	−.05 (.41)	.05 (.41)
Percentage correct predictions	73	73	72	74	76

Notes: n = 97. Standard errors are in parentheses. Significance tests are one-tailed except for the structural-realist variables interacted with *Risk-acceptant*, which are two-tailed.

*$p < .15$.
**$p < .05$.
***$p < .025$.
****$p < .01$.

the predictive power of the probit model remains quite constant, with approximately 74% of the cases correctly predicted. For example, model 5 correctly predicts 40 out of 52 deterrence successes, and 34 out of 45 deterrence failures. These predictions yield an overall success rate of 76%.

If we look at the results in Table 1 concerning the five differing specifications of system structure, hypotheses 1–6 would have predicted negative coefficients on the system uncertainty factors alone and positive coefficients of greater absolute value on the system uncertainty factors interacted with risk propensity. Neither of these patterns emerges. Generally, variables measuring the number of actors (states or alliance coalitions) in the system are insignificant for risk-averse decision makers and are in the wrong direction for risk-acceptant decision makers. Variables measuring the diffusion of capabilities among great power actors are generally in the expected direction, but do not approach substantive or statistical significance.[26] Finally, the risk propensity variable by itself is generally not statistically significant, though it has the predicted positive coefficient. These weak results for the systemic variables are consistent with our earlier argument that the uncertainty created by the international system may have a limited impact on great-power militarized dispute escalation since other great powers' responses to the initiation of a dispute will reduce the challenger's uncertainty about the identity of its allies and adversaries.

We now turn to the findings concerning the variables in the rational deterrence model. Since the marginal effects of these variables differ little across the various equations, we draw our examples of the marginal effects from model 5, the most comprehensive specification of system uncertainty. First, the

TABLE 2

Marginal Impact of Variables from the Deterrence Model on the Probability of Dispute Escalation

CHANGE IN VALUES OF INDEPENDENT VARIABLE	CHANGE IN PROBABILITY OF DISPUTE ESCALATION (%)
Conventional forces	
Challenger:defender ratio of conventional capabilities	
From 1:3 to 1:2	5.3
From 1:2 to 1:1	11.6
From 1:1 to 2:1	11.4
From 2:1 to 3:1	5.0
Nuclear weapons	
Does the defender possess a secure second-strike Capability? (*no* to *yes*)	−50.9
Interests at stake	
Are the defender's proximate territorial interests at stake? (*no* to *yes*)	−41.2
Are the challenger's proximate territorial interests at stake? (*no* to *yes*)	35.3
Previous dispute behavior	
Did the defender capitulate in its previous dispute with the challenger? (*no* to *yes*)	38.0
Did the challenger capitulate in its previous dispute with the defender? (*no* to *yes*)	−26.8
Other dispute involvement	
Was the defender involved in another militarized dispute or war? (*no* to *yes*)	32.5

Note: The changes in the probability of dispute initiation are calculated from the coefficients in the equation in Table 1 by changing the value of a single variable while holding all other continuous variables in the model at their mean values and all dummy variables at zero. The change in position on the cumulative standard normal distribution is then converted into the percentage change in the probability of a deterrence success.

conventional balance of forces has a significant effect on dispute escalation, and nuclear weapons have an even stronger impact. As Table 2 illustrates, a change in the conventional balance from a three-to-one defender advantage to a three-to-one challenger advantage increases the probability of escalation by approximately 33%.[27] In all five equations, the defender's possession of a second-strike capability has a powerful deterrent effect on the escalatory behavior of the challenger, and in all five of the equations this effect is statistically significant. As a result, we are able to distinguish between the deterrent effects of bipolarity and nuclear weapons during the postwar period, and our results suggest that nuclear weapons have had a much greater impact. The defender's possession of a secure second-strike reduces the likelihood of escalation by 51%. This percentage change represents by far the single largest marginal effect in the entire equation. The defender's possession of a second-strike capability does not by itself ensure deterrence success, but it makes a very large contribution toward this outcome.

These results contrast with our previous finding that nuclear weapons do not deter the *initiation* of great-power militarized disputes (Huth, Bennett, and Gelpi 1992). We believe that these differing findings reflect the fact that challengers may be more uncertain about whether a nuclear defender will respond to their initiatives. As a result, they may begin a dispute in order to probe the resolve of the nuclear target, knowing that they can back away from escalation rather than risk nuclear conflict if the defender demonstrates sufficient resolve.

The interests at stake for both challenger and defender are statistically significant and in their expected directions. If a dispute centers on the control or acquisition of territory that is a part of or bordering on the homeland or colonial empire of the defender, the likelihood of challenger escalation is reduced by 41% (Table 2). At the same time, if the dispute centers on territorial issues proximate to the challenger, the likelihood of escalation increases by 35%. These findings confirm our expectation that dispute escalation is not solely a function of conventional or nuclear capabilities. Intrinsic interests at stake also play a role in determining the outcome of a dispute (e.g., George and Smoke 1974; Jervis 1984).

As hypothesized, previous capitulation by either the challenger or defender appears to be a sign of general weakness on their part. If the defender was forced to back down in a previous dispute with the challenger, the likelihood that the challenger will escalate the current dispute increases by almost 38% (Table 2). Similarly, if the defender forced the challenger to capitulate in a previous dispute, then the likelihood that the challenger will escalate the current dispute decreases by 27%. The statistical significance of this result, however, is somewhat marginal ($p < .11$). We believe that this weaker result is due to selection effects which attenuate this coefficient, since some other factors must have induced a previously irresolute challenger to initiate the current dispute.[27]

Our general findings concerning previous dispute behavior support those who emphasize the importance of developing a reputation for toughness with a particular adversary in order to make deterrent threats against them effective in future encounters (e.g., Schelling 1966). We must emphasize, however, that this result does *not* imply that the outcome of previous disputes with third parties has strong reputational effects (see also Hopf 1990; Huth 1988; Snyder and Diesing 1977).

Finally, as hypothesized, we find that the defender's current involvement in other disputes has a positive and significant effect on the likelihood of escalation. This finding suggests that the challenger views the defender's preoccupation with other conflicts as a favorable opportunity for achieving its

goals. If the defender is involved in another conflict, the probability of the challenger escalating its dispute with the target increases by 32% (Table 2). The effect of the challenger's other dispute involvement, however, is not statistically or substantively significant. One possible explanation of this result is that challengers who initiate a dispute against the target despite involvement in other conflicts must be highly resolved to prevail, or they would not have confronted the target to begin with. Consequently, one might expect to find that other dispute involvement affects the challenger's likelihood of initiating a dispute but not their likelihood of escalating one. This explanation is consistent with our previous finding that the challenger's other dispute involvement leads to a lower likelihood of dispute initiation (Huth, Bennett, and Gelpi 1992).

CONCLUSION

Our central conclusion is that rational deterrence theory provides a much more compelling explanation of great-power decisions to escalate militarized disputes than does structural realism. None of the variables from any of the specifications of the structural realist model were statistically significant in the hypothesized direction. Structural theories may provide some insight into the initiation of great-power disputes (Huth, Bennett, and Gelpi 1992), but they do not explain decisions by state leaders to escalate such disputes. In line with the converging body of evidence in support of rational deterrence theory, we find that the variables specified in this model have a consistently significant effect on great-power dispute escalation.

Our results do not offer any support to the logic underlying the Waltzian argument that uncertainty in the international system leads to more conflict (Waltz 1979). As a result, we believe that arguments that draw on Waltz to conclude that emerging multipolarity in Europe represents a significant threat to peace (e.g., Mearsheimer 1990) are overstated. Our previous results suggest that an increase in system uncertainty should not generally lead to an increased incidence of dispute initiation in the international system. Multipolarity would increase the frequency of dispute initiation only if risk-acceptant state leaders greatly outnumber risk-averse leaders. Additionally, in this study we find no evidence that multipolarity will lead to an increased incidence of escalation of those disputes regardless of the risk propensities of decision makers.

The prospects for peace in post–Cold War Europe, and other areas of the globe where great-power interests may conflict, may depend more importantly on the maintenance of credible deterrent policies. The post–Cold War environment has encouraged many policy makers to press for far-reaching reductions in nuclear arsenals. However, our findings suggest that the possession of a second-strike capability has an important deterrent effect. Consequently, great powers such as the United States should not allow their pursuit of the peace dividend to undermine the potency of their nuclear deterrent.

APPENDIX

Table A-1 (on page 620) lists the population of extended and direct-immediate-deterrence encounters among great powers between 1816 and 1984. In total, we identified 97 cases. For each case, we list the great power challenger and defender states, as well as minor power targets when appropriate. In addition, we include our coding on the dependent variable—success or failure of deterrence. The operational criteria for selecting the cases and the coding of the dependent variable have been presented.

TABLE A-1

Deterrence Encounters among Great Powers, 1816–1984

YEARS	GREAT-POWER CHALLENGERS	GREAT-POWER DEFENDERS	MINOR-POWER TARGET	DETERRENCE SUCCESS OR FAILURE[b]
1832–33	UK, France	Prussia	Netherland	F
1833	UK, France	Russia	Turkey	S
1840	France	UK, Russia, Prussia A–H	Turkey	S
1848–49	Prussia	UK, Russia	Denmark	F
1848–49	Russia	UK, France	Turkey	F
1850	Prussia	A–H Russia, France	—	S
1853–56	Russia	UK, France, A–H	Turkey	F
1856–57	Prussia	France, A–H	Switzerland	S
1859	France	A–H, Prussia	—	F
1860–61	France	A–H, Italy	—	S
1861	Russia	UK	Japan	S
1864	Prussia	A–H	Saxony	S
1865	A–H	Prussia	—	S
1866	Prussia, Italy	A–H	—	F
1870	Prussia	France	—	F
1876	UK	Russia	Turkey	F
1877	Russia	UK	Turkey	F
1885	Russia	UK	Afghanistan	S
1893	France	UK	Siam	S
1895	Russia, France, Germany	Japan	—	F
1897	Germany	Russia	China	F
1897–98	Russia	UK, Japan	China	F
1898	France	UK	Egyptian Sudan	S
1899–1900	Russia	Japan	Korea	S
1902–3	Germany, UK, Italy	U.S.	Venezuela	S
1903–5	Japan	Russia	Korea	F
1904	UK	Russia	—	F
1905–6	Germany	France, UK	—	S
1908–9	A–H, Germany	Russia	Serbia	F
1911	Germany	France, UK	—	S
1912–13	A–H, Germany	Russia	Serbia	F
1914–18	A–H, Germany	Russia, France, UK	Serbia, Belgium	F
1914	Japan	Germany	China	F
1915	Japan	Russia	China	F
1915	Germany	U.S.	—	S
1917–20	UK, France, U.S., Italy, Japan	USSR	—	F
1918–19	USSR	UK	Estonia	S
1919–20	USSR	UK, Germany	Latvia	F
1919	Germany	UK	Latvia	S
1920	France	Germany	—	F
1920–22	Japan	USSR	—	F
1920–21	USSR	UK	Persia	F
1920	UK	USSR	—	S
1921	France, UK, Italy	Germany	—	F
1922	Italy	UK	Greece	S
1923	France	Germany	—	F
1931–33	Japan	USSR	China	F
1932	UK, U.S.	Japan	—	S
1933–35	USSR	Japan	Manchukuo	S
1934–36	Italy	UK	Ethiopia	F
1935–36	Japan	USSR	Outer Mongolia	S
1936	Germany	France	—	F
1937	USSR	Japan	Manchukuo	S
1938	USSR	Japan	Manchukuo	F
1938	Germany	UK, France, USSR	Czechoslovakia	F
1938–39	Italy	France, UK	Tunisia	S
1938–40	Japan	UK, France	China	F

TABLE A-1

Deterrence Encounters among Great Powers, 1816–1984 — (Continued)

YEARS	GREAT-POWER CHALLENGERS	GREAT-POWER DEFENDERS	MINOR-POWER TARGET	DETERRENCE SUCCESS OR FAILURE[b]
1939	Germany	France, USSR	Czechoslovakia	F
1939	Japan	USSR	Outer Mongolia	F
1939–45	Germany	UK, France	Poland	F
1940–41	USSR	Germany	Finland	S
1941–45	Germany	USSR	—	F
1941–45	Japan	U.S.	—	F
1945–46	USSR	U.S.	Turkey	S
1946	USSR	U.S.	Iran	S
1948–49	USSR	U.S.	—	S
1949–51	USSR	U.S.	Yugoslavia	S
1950	China	U.S.	Taiwan	S
1950–53	U.S.	China	N. Korea	F
1954–55	China	U.S.	Taiwan	S
1957	U.S.	USSR	Syria	S
1958	China	U.S.	Taiwan	S
1958	U.S.	USSR	—	F
1958–59	USSR	U.S.	—	S
1960–61	USSR	U.S.	Congo	S
1961	U.S.	USSR	Cuba	S
1961	U.S.	USSR	Cuba	S
1961	USSR	U.S.	—	S
1962	China	USSR	—	S
1962	U.S.	USSR	Cuba	F
1964–65	USSR	China	—	S
1965	U.S.	China	N. Vietnam	F
1966–68	China	USSR	—	S
1969	China	USSR	—	S
1970	U.S.	USSR	Syria	F
1973	USSR	U.S.	Israel	S
1974	China	USSR	Mongolia	S
1977	USSR	China	—	S
1978	China	USSR	—	S
1978–79	U.S.	USSR	Iran	S
1978–79	China	USSR	Vietnam	F
1979	U.S.	USSR	Cuba	S
1979–80	USSR	China	—	S
1980	China	USSR	—	S
1983	U.S.	USSR	Iran	S
1983–84	USSR	U.S.	—	S
1983–84	U.S.	USSR	Syria	S

Source: For a list of sources used to identify these cases see Huth, Bennett, and Gelpi 1992.
[a]Austria–Hungary.
[b]S = deterrence success; F = deterrence failure.

Notes

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1. Structural realism as a theoretical framework encompasses at least three major lines of argument: (1) the impact of the security dilemma, (2) the importance that states place on relative gains, and (3) the relationship between system uncertainty and the likelihood of war. We restrict our attention to the third of these but use the general label of structural realism for ease of presentation.

2. Waltz argues that a tripolar system is inherently unstable because two powers will align with one another and eliminate the third power (1979, 163).

3. Our use of the term *uncertainty* is different from uncertainty in decision theory (Luce and Raiffa 1957), where uncertainty refers to a situation in which the probability distribution over different outcomes of a choice is unknown. *System uncertainty* here refers to the riskiness of escalating a conflict independent of a decision maker's estimated probability of prevailing in the dispute.

4. In order to avoid repetition and awkward phrasing, we will refer hereafter to "system uncertainty" without directly linking it to the perceptions of decision makers.

5. In our statistical analysis, we control for the effects of the expected value of each decision alternative, which enables us to estimate the independent effects of risk propensity interacted with systemic uncertainty.

6. Risk propensity also affects how individuals choose between options that have *different* expected values in a similar manner. For greater detail, see Huth, Bennett, and Gelpi 1992.

7. We assume that value of the status quo is certain because the psychological conception of risk propensity we have presented requires that decision makers know with certainty whether they are in the domain of gains or losses.

8. In applying the structural realist model, however, we supplement this rational-choice approach with insights from cognitive psychology concerning the sources of risk propensities.

9. Fearon (1990) argues that these selection effects should lead us to expect that the signs on the coefficients will be *reversed*. However, following Achen (1986), we believe that the only general conclusion that can be reached is that positive (negative) coefficients will be driven downward (upward). As a result, it is possible but not necessary that signs will be reversed.

10. We draw on Bueno de Mesquita (1978), who identifies but does not test the links between systemic uncertainty, risk propensity, and conflict behavior.

11. By interacting risk propensity with system uncertainty, we reconcile the contrasting predictions of Waltz (1979) and Deutsch and Singer (1964) in their long-standing debate regarding the relative merits of bipolar and multipolar systems. In order to be logically consistent, Waltz must implicitly assume risk-acceptant states in his work, whereas Deutsch and Singer must assume the opposite (Bueno de Mesquita 1978). Thus Waltz's contention that multipolarity increases the likelihood of conflict is logically correct only with regard to risk-acceptant decision makers. Similarly, Deutsch and Singer's argument that multipolarity is less conflict-prone is sustainable only with regard to risk-averse decision makers.

12. The list of authors who have discussed the importance of the balance of military forces is much too long to cite fully here, but a few examples are Bueno de Mesquita 1981, Huth 1988, Mearsheimer 1983, Powell 1990, and Wu 1990.

13. Consistent with the logic of our hypotheses concerning the defender's possession of a second-strike capability, we would test the following hypotheses regarding the challenger's possession of nuclear weapons: 1) In a situation of mutual assured destruction, the challenger's nuclear capability is of no coercive value because such coercive threats would lack sufficient credibility in the face of a retaliatory threat. Hence a challenger would not be more likely to escalate a dispute in such a situation. 2) In the absence of a situation of mutual assured destruction, the challenger's nuclear forces would be of coercive value, and thus the challenger would be more likely to escalate. Unfortunately, our population of cases does not allow us to test these hypotheses along with hypothesis 8. High levels of colinearity between the defender's possession of a second-strike capability and a situation of mutual assured destruction prevents us from obtaining reliable separate coefficients for these variables. In addition, our data set contains only three cases of the challenger's possessing nuclear weapons while the defender does not (see Appendix).

14. The hypothesis that decision makers will become more resolved following a capitulation in order to recoup reputational losses cannot be incorporated into a rational framework in which preferences are fixed because decision makers were aware of the reputational costs when they chose to capitulate.

15. We required that a deterrence encounter had to last at least one week with a militarized response by both sides in order to minimize the chance of including minor border incidents as well as cases in which great powers did not even consider escalation because the issues at stake were of limited political or strategic importance (e.g., fishing-boat incidents and airspace violations).

16. The cases listed in the Appendix draw in part on our previous work (Huth, Bennett, and Gelpi 1992). However, this data set includes a broader population of disputes since we no longer restrict our attention to great-power rival dyads.

17. The reason we do not simply code the dependent variable based upon the occurrence of war is that the absence of war does not necessarily indicate deterrence success. In some cases, the defender will capitulate precisely because it believes that it will be unable to deter the challenger.

18. For contrasting views regarding both the identification of deterrence encounters and the coding of deterrence success, see Lebow and Stein 1990. For a detailed discussion of the logic underlying the coding procedure which we use, see Huth and Russett 1990.

19. The demographic and industrial capabilities of states are not included in our measure because previous work finds that decisions to go to war are based generally on calculations of whether victory can be attained in a quick armed conflict (e.g., Anderson and McKeown 1987; Huth 1988; Mearsheimer 1983).

20. The bivariate correlations among components 2–6 are

	2	3	4	5
1. No. of great powers	.76	.12	−.28	.75
2. No. of clusters	—	−.07	−.41	.86
3. Diffusion among great powers	—	—	.51	.14
4. Diffusion among clusters	—	—	—	−.22
5. Cross-cutting ties	—	—	—	—

Factor analysis was performed using oblimin rotation in order to allow for correlation between the factors. Correlation between factors is .04. The factor loadings on factors 1 and 2, respectively, are *number of great powers* .806, .004; *number of clusters* .867, −.036; *average alliance tightness across clusters* .842, −.127; *diffusion of power across great powers* .284, .751; and *diffusion of power across clusters* −.102, .773. For a discussion of factor analysis techniques, see Kim and Mueller 1978. Henceforth, factors 1 and 2 will be referred to as system uncertainty 1 (system size) and system uncertainty 2 (capability diffusion), respectively.

21. We recognize that Bueno de Mesquita (1985) has refined this measure. However, his new risk propensity indicator is continuous, and its use here would make the interpretation of our results concerning the interaction of risk and system uncertainty quite difficult.

22. This index includes iron and steel production and energy consumption for all years. Oil production is added in 1900, and aluminum production is added in 1930.

23. We code this variable as a dummy instead of using the actual number of disputes because we almost never observe involvement in more than one other dispute in our data set. Consequently, we are unable to draw reliable conclusions regarding the effects of additional disputes.

24. One equation we were unable to estimate because of multicolinearity included the number of alliance clusters, the distribution of capabilities among clusters, and the level of ties across cluster boundaries.

25. Auxiliary regressions show in each specification that multicolinearity among the independent variables is not a problem.

26. Some readers may be concerned that our estimates concerning the effects of system uncertainty in interaction with risk propensity might be damaged by the fact that our measure of risk acceptance may be correlated with preventive or diversionary incentives for conflict. However, additional probit analyses in which we controlled for the independent effects of these factors indicated that their inclusion in the analysis did not change our estimates of the other variables.

27. Additionally, we believe that selection effects may explain the differences between our results and those of Leng (1983). He finds that in repeated confrontations, states that have lost a previous encounter with their adversary tend to resort to more coercive bargaining strategies in the following dispute. Leng's study selected only cases of at least three repeated confrontations between the same adversaries. As a

result, Leng excludes cases in which a challenger, after having been defeated once or twice, fails to initiate a third dispute. It seems likely that Leng's analysis focused on a set of particularly motivated challengers.

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Paul Huth is Assistant Professor and Christopher Gelpi is Doctoral Candidate of Political Science, University of Michigan, Ann Arbor, MI 48109.

D. Scott Bennett is Visiting Assistant Professor of Political Science, State University of New York at Buffalo, Buffalo, NY 14260.