System Uncertainty, Risk Propensity, and International Conflict Among the Great Powers

PAUL HUTH
D. SCOTT BENNETT
CHRISTOPHER GELPI
University of Michigan

The authors investigate the relationship between system structure and the initiation of militarized disputes among Great Powers. The central hypotheses concern the interaction between system uncertainty and the risk propensity of national decision makers. The authors employ a research design that enables them to incorporate explanatory variables from various levels of analysis into their theoretical model. The model is tested by probit analysis on a pooled time series of Great Power rival dyads from 1816 to 1975. The empirical results support the central hypothesis that the effects of the international system are mediated by the risk propensity of decision makers. In addition, the authors find that dyadic- and unit-level variables such as arms races, power transitions, and the current and past dispute behavior of rivals also have significant effects on conflict behavior. Finally, the results indicate that nuclear weapons do not seem to have a systematic impact on the initiation of militarized disputes among Great Powers.

Systems-level theory has been the focus of considerable scholarly work on the causes of international conflict for two powerful reasons. First, it seems intuitively plausible, perhaps even compelling, to argue that the decisions and actions of foreign policy elites are shaped in significant ways by the broader international environment in which they operate. Second, systems-

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level theory is parsimonious and therefore theoretically attractive. Many scholars are drawn to the argument that fundamental patterns of international conflict can be explained by the structural attributes of the international system.

Because of its theoretical attractiveness, many scholars have made impressive attempts to test empirically systemic theories of conflict behavior (Brecher, James, and Wilkenfeld 1990; Bueno de Mesquita 1978; Bueno de Mesquita and Lalman 1988; Kim 1989; Levy 1985; Midlarsky 1974; Oren 1990; Ostrom and Aldrich 1978; Singer 1989; Singer, Bremer, and Stuckey 1972; Spiezio 1990; Thompson 1986; Wallace 1985; Wayman 1984). Unfortunately, these studies have failed to discover robust empirical relationships between system structure and international conflict. One reason that the debate concerning the effects of polarity on international conflict has not been clearly resolved is that these studies have not tested a potentially important mechanism by which system structure might influence decision makers' actions. Specifically, we hypothesize that the interaction of decision makers' risk propensities with their perceptions of the uncertainty present in the international system will affect their decisions to initiate conflict.

This article builds on existing work in three ways. First, we develop a more complete theoretical model of how system structure determines system uncertainty. Second, we expand on the work of Bueno de Mesquita (1978) who has specified how system uncertainty relates to conflict behavior through its interaction with the risk propensities of decision makers. By including the risk propensities of decision makers in the theoretical model, seemingly opposing propositions about how system uncertainty affects conflict (Waltz 1964, 1979; Deutsch and Singer 1964) can be reconciled and properly tested. We develop a new measure of risk propensity based on experimental findings from psychology (Quattrone and Tversky 1988). Third, we develop a research design that allows the testing of the interactive effects of system uncertainty and risk propensity while controlling for the effects of other variables at the dyadic and unit levels. We find that system uncertainty, when interacted with the risk propensities of decision makers, *does* have a significant impact on the likelihood of dispute initiation among Great Powers. However, the overall explanatory power of structural variables in our model is limited. This suggests that structural realist approaches to explaining international conflict behavior among Great Powers should be supplemented with variables from other theoretical approaches.

This article is divided into several sections. First, we define the concepts that are central to our theoretical model. Second, we formulate propositions relating systemic, dyadic-, and unit-level variables to conflict behavior.

Third, we present a research design for testing the model and discuss the operationalization of the variables. Fourth, we discuss the results of our empirical tests. Finally, we conclude by considering the theoretical and policy implications of our findings.

DEFINING KEY CONCEPTS

In this section we define a number of concepts that are central to understanding the theoretical model and the research design to be employed in testing the model.

Structure of the International System

In general, a system is defined as a self-contained set of interacting and interdependent units. The structure of the system is determined both by the ordering of units according to power resources and by the density and arrangement of linkages among those units. This structure, in turn, creates incentives that lead to recurring patterns of unit behavior. In this article, the international system is conceived of as the interdependent relations among the Great Powers. Specifically, international structure is defined in terms of (1) the number of Great Powers in the system; (2) the number of Great Power alliance clusters;[1] (3) the distribution of military capabilities across both the individual Great Powers and the alliance clusters in the system; and (4) the degree to which there are alliance ties cutting across these alliance clusters (Singer 1989, 3-4; Waltz 1979, chap. 5).[2]

1. The units in the international system can be defined either as the individual Great Powers or as the distinct alliance groupings among these states. An alliance cluster is defined as a group of Great Powers who share similar (but not necessarily identical) alliance ties. These shared alliance ties are assumed to indicate that the cluster members have similar security interests. Some scholars, such as Waltz (1979), do not consider alliances to be particularly important, while other scholars, such as Deutsch and Singer (1964), disagree. We include both conceptions because we do not believe that there is a compelling logical argument for excluding alliances, and the existing empirical findings on alliances and international conflict are ambiguous (for example, see Bueno de Mesquita 1981b; Huth 1988; Huth and Russett 1988; Kim 1989; Levy 1981; Oren 1990; Siverson and Tennefoss 1984).

2. Our conception of international structure is broader than that of Waltz (1979). For Waltz the critical distinguishing feature of the international system is the number of Great Powers. Waltz further narrows his definition of the relevant aspects of system structure (1979, 163) by asserting that only one distinction among international systems is important in understanding state behavior: the difference between systems with two Great Powers and systems with four or more such states. (Waltz asserts that a tripolar system is quite unstable and will revert to a bipolar system.) We believe that this definition is too narrow because it excludes attributes of the system that are likely to affect the uncertainty confronted by decision makers.

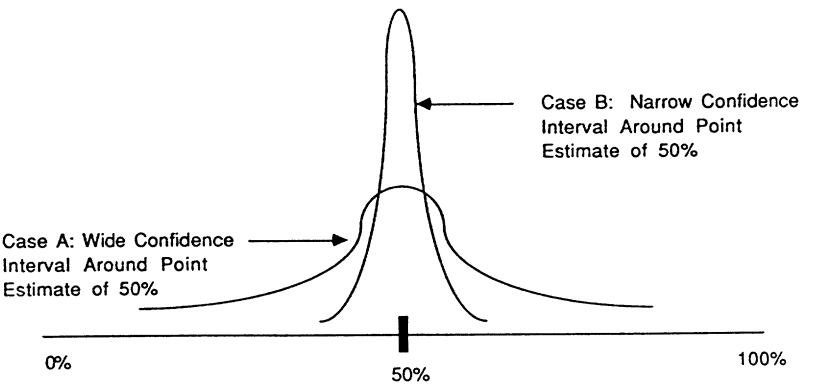

Figure 1: High versus Low Levels of System Uncertainty

System Uncertainty

We conceive of uncertainty in the international system as the size of the implicit or explicit "confidence interval" that decision makers place around their estimates of the expected outcome of initiating an international conflict.[3] That is, given some expectation of an outcome (win, lose, or draw) the level of system uncertainty refers to the amount of variance around this estimate (see Figure 1).[4] As the level of system uncertainty decreases, decision makers become more confident of their beliefs concerning the outcome of a confrontation with other states. Conversely, as system uncertainty increases, this confidence decreases. The level of system uncertainty is a function of the structural attributes of the international system. The

3. Hereafter we will refer to "system uncertainty" without directly linking it to the perceptions of decision makers. We use this shorthand only in order to avoid repetition and awkward phrasing. We do not mean to imply that system uncertainty exists independent of the perceptions of decision makers.

4. Our use of the term "uncertainty" is different than 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 initiating a conflict independent of a decision maker's estimated probability of prevailing in the dispute. Holding this estimated probability constant, it is more risky to initiate a conflict when you are less confident that your estimate is correct. An application of this alternative conception of uncertainty to international politics can be found in Morrow (1987, 89).

precise relationship between structure and system uncertainty will be developed fully in the theoretical section of this article.

Risk Propensities of Decision Makers

Risk propensities capture the fact that different decision makers may make different choices when faced with the same set of alternatives solely because of their attitudes towards choosing options with probabilistic outcomes. The concept of risk propensity is most clearly revealed by comparing patterns of individual choice between options that have similar expected value but vary in their probabilities and payoffs.[5] For example, assume that there are two alternatives with the same expected value. Also assume that the first alternative has a high payoff but a low probability of receiving that payoff, whereas the second alternative has a low payoff but a high probability. A risk-acceptant actor will select the former whereas a risk-averse actor will choose the latter (Luce and Raiffa 1957).[6]

We believe that there are two important sources of risk attitudes: individual and situational. The standard conception of risk attitude (widely employed in rational choice models) holds that individuals have personality characteristics that predispose them to take or avoid risks. More recently, cognitive psychologists have argued, based on experimental findings, that risk attitudes vary with the situational context in which decisions are made (see, for example, Kahneman and Tversky 1979, Quattrone and Tversky 1988).[7] When individuals frame their choice of options from the perspective of trying to avoid losses, they are likely to be risk acceptant when making

5. Our statistical analysis will hold constant the components of expected value, allowing us to determine the independent effects of differences in risk propensity interacted with systemic uncertainty.

6. Risk propensity also effects the manner in which individuals choose between options that have different expected values. Risk-averse actors may choose an option with a lower expected value but with a high probability, while risk-acceptant actors may gamble on a higher expected value with less certainty. Technically, utility is a measure of an actor's preferences over outcomes in risky situations, and the curvature of an actor's utility function reflects its willingness to take risks (Morrow 1987, 430). Risk propensity affects the utility of actors for choices between lotteries with different probability distributions across the possible outcomes. In particular, refraining from initiating a conflict represents a choice to accept a relatively certain status quo, while initiating a conflict involves accepting a lottery between extreme outcomes (i.e., win or lose). System uncertainty increases the *range* of possible probabilities of victory that decision makers must accept when deciding to initiate a conflict.

7. We recognize that the evidence for the situational conception of risk propensity is based on empirical results derived from highly controlled experimental situations. We view our work as an attempt to apply and test this conception to foreign policy decision making in historical cases.

their decisions. Conversely, when the options are viewed as an opportunity to make gains, individuals will be risk averse when making their decisions.

Great Power Rivalries

Although the preceding concepts are central to the theoretical model to be presented in this article, the concept of a Great Power rivalry is critical because it identifies the population of cases to be used for testing the model's propositions. In an interstate rivalry there are periodic military and diplomatic challenges to the status quo disputed by one or both of the states. The basis of the rivalry may be competing claims to sovereignty over territory (the national territory of the states themselves or that of a third party) or influence over the economic, political, or military policies of another state. In particular, a political-military rivalry includes the following elements: (1) one or both parties are not satisfied with the status quo, so there is a possible challenge to the status quo to be deterred; (2) the military option is viable for the dissatisfied state(s); and (3) given the history of periodic manifest threats, each state is likely to view the other as a primary security threat.[8] We limit our attention to Great Power rivalries because systemic theories focus on explaining the international conflict behavior among the major powers in the international system. For each rivalry, we designate the state(s) dissatisfied with the status quo as the challenger, and the state defending the status quo as the rival. In the research design section of this article we present a list of the Great Power rivalries accompanied by a more detailed discussion of the rationale for using the rival dyad as the unit of analysis.

THEORETICAL FRAMEWORK AND HYPOTHESES

Our theoretical model captures in simplified form many of the key variables that may shape the decisions of foreign policy elites who are considering whether to threaten or resort to the use of force against a rival in

8. Rivalries in the international system can also stem from disagreement over issues in which the threat of military force is not considered a plausible instrument for resolving competing claims. Given our theoretical interest in understanding the causes of crises and war, we limit our analysis to rivalries in which the threat of a military confrontation does exist. We do not define a rivalry solely by the frequency of militarized disputes as do Gochman and Maoz (1984) and Diehl (1985). We view the outbreak of militarized disputes as manifestations of a rivalry, reflecting competing claims to territory, economic resources, and so on, and not an underlying cause of the rivalry itself. We focus therefore on dyads in which a challenger desires to overturn the status quo favored by its rival.

an attempt to change the prevailing status quo. We use primarily a rational choice approach, supplementing it with arguments and insights from cognitive psychology concerning risk propensities. In the model, we focus primarily on the effects of system structure. However, we also formulate a number of hypotheses about the effects of control variables from alternative levels of analysis on conflict behavior. Specifically, we present hypotheses concerning (1) the structure of the international system; (2) the dyadic relationships between challenger and target; and (3) the internal sources of behavior that affect challenger and rival. The model is summarized in Figure 2.

The outbreak of war in the international system is typically a two-stage process of dispute escalation. In the first stage, a state decides to challenge the prevailing status quo by threatening the use of force. Once the challenge is resisted, the states involved must decide whether to stand firm and resort to the use of force to protect their security interests, or back down in order to avoid the costs of war. Rarely does a conflict of interest between states lead directly to war. Theoretically, system structure should affect both stages of this escalatory process. In this article we focus on stage one.

We argue that the decision makers in the challenging state choose between accepting the status quo and initiating a conflict based on the expected value of conflict versus the payoff expected from the status quo. The expected value of conflict initiation includes calculations concerning the gains or losses anticipated from a conflict and the likelihood of prevailing either in the event of war or a diplomatic confrontation in which the target makes concessions under the threat of war. The expected value of the status quo is affected by internal factors, such as the domestic political situation within the challenger, and by dyadic power relationships such as whether the rival's military position is increasing relative to the challenger.[9] Systemic factors affect decision makers' confidence in probability estimates and therefore the likelihood that they will initiate militarized disputes.

A. SYSTEM-LEVEL HYPOTHESES

The central debate concerning the effect of system structure on conflict among the Great Powers is based on the direct relationship between system structure and system uncertainty. To appreciate the different theoretical positions in the debate it is necessary first to understand this relationship. As

9. We treat the value of the status quo as certain because it is unclear how to assign probabilities to the possible outcomes associated with the noninitiation of conflict. This simplification allows us to use the psychological conception of risk propensity previously presented because this conception requires that decision makers know with certainty whether they are in the domain of gains or losses.

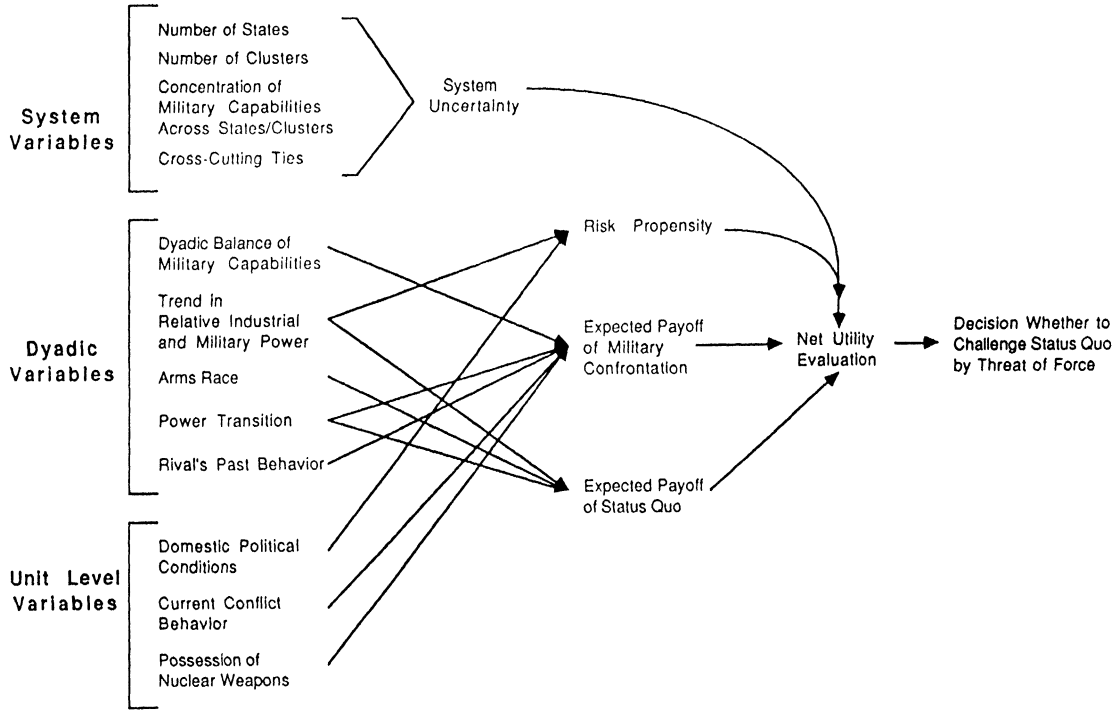

Figure 2: Components of Challenger's Decision to Initiate Conflict

the number of units in the system increases, the interdependence of foreign policy behavior increases, making the prediction of both national and multilateral actions more difficult. This difficulty reduces decision-maker confidence in predicting international responses to their initiation of conflict. Similarly, as military capabilities become more evenly distributed among the units, decision-maker confidence decreases because the accuracy of predictions becomes increasingly sensitive to errors in estimating the response of other units.[10] Finally, as the cross-cutting ties in the system increase, it becomes more difficult to predict behavior. Common military ties reflect shared interests between states. The more ties a particular state has with an opposing cluster, the lower the reliability of its support for members of its own cluster because its interests are divided between clusters. As a result, the behavior of such a state is more difficult to predict and uncertainty increases.[11]

There are two opposing schools of thought concerning the likely effects of system structure on state behavior. Waltz (1964, 1979) argues that bipolar systems are more peaceful than multipolar ones. System uncertainty is low in bipolar systems and high in multipolar ones, and because Waltz (1979, 168) argues that "rather than making states properly cautious and forwarding the chances of peace, uncertainty and miscalculations cause wars," he concludes that bipolar systems will be more stable than multipolar ones. Waltz identifies two dynamics to explain why multipolarity is more unstable than bipolarity: (1) entrapment, and (2) buck-passing.[12]

Waltz recognizes that the coalitional dynamics present in multipolar systems make it difficult for decision makers to estimate who will oppose whom and with how much capability in the event of conflict (1979, 168).

10. Several examples will help to illustrate these general arguments. Given any number of units, an equal distribution of military capabilities involves more uncertainty than a skewed distribution. If there are two actors, a 50-50 (even) distribution leads to a wider variance in possible outcomes (more uncertainty) than a 75-25 (skewed) distribution. If instead there are four actors, a 25-25-25-25 distribution is more uncertain than a 55-15-15-15 distribution. Similarly, given any particular distribution of capabilities, the number of units has an independent effect on uncertainty. Under an equal distribution of capabilities, 25-25-25-25 is more uncertain than 50-50. That is, there is a wider range of possible outcomes that could occur in the first situation.

11. It should be noted that this interpretation of the effect of cross-cutting ties on state behavior is not built on the mechanism of third-party mediation identified by Deutsch and Singer (1964). Because our theoretical focus is on system uncertainty, this specific mechanism is not addressed in our model.

12. Entrapment occurs when a country becomes an unwilling participant in a conflict started by its ally because it is dependent on its ally for its own security and fears being abandoned by its ally when its own vital security interests are at stake. Buck-passing occurs when a country shifts responsibility for responding to a threat onto its allies rather than honoring its alliance commitments, due to the expectation that its allies will oppose the threat. This is the familiar problem of collective action (Olson 1965).

Given Waltz's theoretical framework, however, this increased uncertainty can lead systematically to more conflict initiation only if one assumes that the challenger expects the rival coalition to engage in buck-passing while it is able to entrap it allies. We see no logical reason to accept this argument. Even if decision makers consistently misjudge their adversaries, without further explanation, one should expect a *random* pattern of over- and underestimation of the capabilities and resolve of adversaries. If such a random pattern were to occur, then one would expect no systematic relationship between high levels of uncertainty, misestimation by the challenger, and conflict initiation in the system.

In contrast, Deutsch and Singer (1964) and Singer (1989) argue that stability is greatest when there are multiple states and clusters in the system and military capabilities are evenly distributed. Under such conditions system uncertainty is high, which they believe deters conflict initiation. For example, Singer (1989) states that "ambiguity and uncertainty is what inhibits escalatory behavior" (p. 6). Deutsch and Singer argue that the fact that each nation must divide its limited attention between many actors in a multipolar system will result in states' inability to concentrate enough attention (the "critical attention ratio") on any other single actor to initiate a conflict. Although Deutsch and Singer (1964) do not explicitly relate multipolarity to system uncertainty, one could argue that when states are able to focus only a limited amount of attention on each actor in the system, their ability to predict the behavior of those actors confidently will be diminished. Additionally, we argue that in a multipolar system, all major powers are likely to rely on one another for security and support. Each country understands that a current opponent may be an important ally in the future, making it critical for states not to alienate one another. This security interdependence makes it difficult for decision makers to predict reliably the behavior of other states.

Although the previous section identifies links between multipolarity and system uncertainty, the mechanism by which this uncertainty should consistently generate lower levels of conflict is unclear. As we argued previously, there is no reason that an inability to predict the behavior of other actors by itself should result in anything but a random pattern of over- and underestimation of relative capabilities by the challenger.

Bueno de Mesquita (1978) identifies but does not test the effect of one intervening factor—the risk propensities of decision makers—which links

13. Additionally, Bueno de Mesquita (1978) argues that at least three other aspects of system structure are important components of system uncertainty: change per unit time in (1) capability distribution; (2) the number of actors in the system; and (3) system tightness. The central debate

system uncertainty and conflict initiation in a logically consistent fashion.[13] When system uncertainty is high, risk-acceptant decision makers may be willing to gamble by embarking on policies that run the risk of provoking international conflict. If decision makers are risk averse, however, high system uncertainty should lead to greater caution and restraint in decisions regarding the initiation of international conflict. System uncertainty should thus have *opposite* effects on conflict initiation depending on the risk propensity of relevant decision makers. Consequently, if system uncertainty is not interacted with risk propensity it should have no systematic effect on state behavior. Bueno de Mesquita notes that Waltz (1964) implicitly assumes risk-acceptant states in his theory whereas Deutsch and Singer (1964) assume just the opposite. One important implication of the theoretical integration of system uncertainty with risk propensity is that the arguments of both Waltz and Deutsch and Singer may be correct, but only under more restricted conditions.

Drawing on the work of Bueno de Mesquita, we test the hypothesis that decision makers' reactions to uncertainty in the international system will be mediated by their risk propensity. We supplement Bueno de Mesquita's (1981a, 1985a) game-theoretic conception of risk propensity with the psychological conception of risk propensity developed in prospect theory (Kahneman and Tversky 1979; Quattrone and Tversky 1988).

Hypothesis 1: Given a risk-acceptant decision maker, the greater the level of system uncertainty, the higher the probability that a challenger will initiate a militarized dispute against its rival.

Hypothesis 2: Given a risk-averse decision maker, the greater the level of system uncertainty, the lower the probability that a challenger will initiate a militarized dispute against its rival.

B. DYADIC-LEVEL HYPOTHESES

Although the interaction between system uncertainty and risk attitude is the main focus of this project, we control for alternative explanations that are cast solely at the dyadic level of analysis.

Dyadic balance of military capabilities. As the military capabilities of a state increase relative to its rival, the costs of armed conflict decrease and, therefore, the state may attempt to use that military advantage to coerce the

in the literature has not focused on any of these variables. Because we are primarily interested in addressing this debate, we do not pursue the theoretical and empirical implications that follow from this alternative conception of system uncertainty.

rival into making concessions, or to impose a change in policy through victory on the battlefield. These capabilities should take into account both the probable support from allies and the distance between the two states in the dyad and the point at which conflict is likely to occur.

Hypothesis 3: The more favorable the balance of military capabilities for the challenger, the higher the probability that it will initiate a militarized dispute against its rival.

Arms races. One longstanding explanation of international conflict concerns the effects that acquiring weaponry may have on the likelihood of war between two nations. (For a literature review, see Siverson and Diehl 1989.) Although these arguments have taken many different forms, at their core is the notion that spending resources on armaments spoils political relations between states by creating perceptions of hostile intent.[14] As "enemy images" become more deeply ingrained, it becomes difficult for both parties to agree to compromises. As a result, the opportunity for an acceptable diplomatic resolution decreases, making military conflict more likely.

Hypothesis 4: As both challenger and rival accelerate their arms acquisitions, the challenger will be increasingly likely to initiate a militarized dispute with its rival.

Past behavior of rival. Earlier work (Huth 1988, Leng 1983) has indicated that the current conflict behavior of states is influenced by the outcomes of previous confrontations. In particular, if a state has been forced to backdown and suffer a diplomatic defeat in a militarized dispute with another state, its bargaining reputation will have been damaged. Foreign policy elites may view their defeat of the rival as a sign of weakness on the part of their opponent.[15] Dissatisfied states may view such moments of weakness as "windows of opportunity" through which they may achieve their geopolitical objectives. Consequently, we should expect that if a rival state failed to respond to a threat by the challenger or was forced to suffer a diplomatic

14. Another process by which arms races can lead to conflict initiation is through the effect of arms acquisition on the balance of military capabilities between adversaries, creating temporary advantages for one side or the other (Morrow 1989). We capture this dynamic in our tests of the preventive motive, power transition, and dyadic balance of forces hypotheses.

15. Logically, we would also like to test the argument that a previously defeated *challenger* will also be more likely to initiate a militarized dispute in an attempt to restore its bargaining reputation by achieving a diplomatic or military victory (see Huth 1988; Leng 1983). Unfortunately, our data set contains so few cases of this phenomenon that we are unable to test this argument.

defeat in a previous confrontation, the challenger will be more likely to initiate another dispute in the near future.[16]

Hypothesis 5: A diplomatic defeat for the rival in a recent militarized dispute with the challenger will lead to a higher probability that the challenger will initiate another militarized dispute against its rival.

Preventive motive for conflict. The dynamic balance of military forces (relative trends in military power) has an effect on conflict behavior independent of the static balance of military power. Scholars have argued that decision makers will be more likely to initiate a conflict against a rival if they recognize that their state's relative power position is declining with respect to the rival, and that their current position of power advantage may become one of disadvantage in the future (Levy 1987). Decision makers may calculate that it would be better to risk armed conflict at present while in a more favorable position than to wait and either possibly be attacked or initiate armed conflict when their likelihood of success will be lower.

Hypothesis 6: The sharper the decline of the challenger's current position of military advantage relative to its rival, the higher the probability that the challenger will initiate a militarized dispute against the rival.

Power transition. Scholars have argued that conflict is particularly likely when rival states' military capabilities are changing in a situation of near-parity (Doran and Parsons 1980; Houweling and Siccama 1988; Kugler and Organski 1989; Morrow 1989; Organski and Kugler 1980). For a challenger whose current military position is in decline, there is a preventive incentive to attack its rival.[17] Conversely, when the challenger's relative military position is improving, there is an incentive for it to test the resolve of its rival and increased confidence in its ability to overturn the status quo by the use of force.

Hypothesis 7: In a situation of nearly equal military capabilities between challenger and rival, a significant gap in relative military growth rates will result in a higher probability that the challenger will initiate a militarized dispute against the rival.

16. It is particularly important to control for this variable in our study that consists of rival dyads over time. Without including this variable we would expect a significant degree of autocorrelation across time.

17. The idea of a power transition captures some situations in which preventive incentives for conflict initiation are also present. However, the power transition hypothesis differs from the preventive motive hypothesis discussed previously both because it is restricted to situations of near parity and because it includes cases of both challenger growth and decline.

C. UNIT-LEVEL HYPOTHESES

In addition to dyadic-level control variables we include unit-level control variables.[18]

Current conflict behavior of challenger and rival. The diplomatic and military resources which a state may direct toward a confrontation with a rival depend partly on its involvement in disputes outside of that particular dyadic rivalry. The fact that diplomatic and military resources are committed to a specific dispute make it unlikely that the state will be in a favorable position to prevail in disputes with other states at the same time.

Hypothesis 8: Challenger involvement in a militarized dispute or war with a third state leads to a lower probability that the challenger will initiate a militarized dispute against its rival.

Hypothesis 9: Rival involvement in a militarized dispute or war with a third state leads to a higher probability that the challenger will initiate a militarized dispute against the rival.

Possession of nuclear weapons. Drawing on the standard logic presented in the deterrence literature, we hypothesize that if the rival possesses the ability to attack the challenger with nuclear weapons, there should be a deterrent effect on the conflict behavior of the challenger (Huth 1990; Weede 1983; Waltz 1990; for opposing evidence see Kugler 1984; Geller 1990).

Hypothesis 10: If the rival can threaten the challenger with nuclear attack, the probability that the challenger will initiate a militarized dispute against the rival will decrease.

RESEARCH DESIGN AND OPERATIONALIZATION OF MODEL

A. POPULATION OF CASES FOR TESTING

We test our hypotheses on the population of Great Power rivalries from 1816 to 1975. This approach gives us a very different population than typical studies that use system years as the unit of analysis of how system structure

18. One unit-level theory of the causes of international conflict argues that political elites will turn to an aggressive foreign policy under conditions of internal political instability (James 1988; Levy 1988, 1989; Vincent 1981; Russett 1990). Unfortunately, the data necessary to test such an argument – number of strikes, political protest and rebellion, and detailed information on economic conditions – are not available across a sufficiently large portion of our data set to allow empirical testing. Consequently, we are unable to address this hypothesis.

affects conflict behavior. A significant drawback of this typical approach is that it does not allow the analyst to test for nonsystemic causes of international conflict. Models operationalized at the system level cannot be fully specified. Analysts must make the assumption (explicitly or implicitly) that nonsystemic variables can be safely ignored.

The use of dyads as the unit of analysis allows the testing of contending theoretical propositions from different levels of analysis. It is both possible and theoretically appropriate to study the effects of the international system at the dyadic level, because, if system structure is related to conflict behavior, the causal mechanism must include the effects of this structure on the decisions of national leaders. Because our theoretical model focuses on the decisions of a potential challenger to initiate a conflict against its rival, we can test for these effects.

At the dyadic level, we select Great Power rival dyads as our population. As stated previously, because we are interested in systemic effects, we include only Great Powers in our study. We include only rival dyads because the inclusion of *all* Great Power dyad-years would include inappropriate cases. Given our focus on conflict initiation, the variables specified in our hypotheses should have an effect only in situations where states consider the use of force. Although a strict realist might argue that there is always the potential for conflict between any two Great Powers, we believe that geography, technology, past history, and other factors result in the emergence and persistence of disputes and perceptions of threat between particular states over extended periods of time (Walt 1987). Within these rivalries, force is frequently considered as a method of resolving conflicts of interest, whereas outside such rivalries military force often may not even be entertained as a policy alternative.

The primary strength of studying rivalries, then, is that we minimize the possibility of including irrelevant cases. However, we do run the risk of excluding some relevant dyads in which conflict is plausible because we do not characterize them as rivalries. We believe that minimizing the first type of error (inclusion of many irrelevant dyads) should take priority over the latter (exclusion of a few relevant dyads) in order to ensure internal validity by conducting our empirical analysis only on appropriate dyads.

Our analysis of Great Power rivalries shifts the focus of our study somewhat. Our question is, "What effects do system-level variables have on conflict initiation between great powers rivals?" The parallel question if the unit of analysis was the system would be, "What effect does system structure have on the number of conflicts initiated among Great Powers in the international system?" This alteration in theoretical focus is not inappropriate.

Indeed, if the system does not have a significant impact on the outbreak of conflict among rival Great Powers, then it is unlikely to be of consequence elsewhere. It is important to note that we do not address the question of what causes rivalries. However, we have attempted to minimize the effects of selection bias within our population by not defining rivalries on the basis of the dependent variable – the frequency of militarized disputes (Achen 1986).

For each rivalry, one or both states are designated the challenger. A challenger is a state that desires to overturn the prevailing territorial or political status quo on those set of issues that two parties contest over a protracted period of time. Within a rivalry, it is possible to designate both sides as challengers because both states may be dissatisfied with the prevailing state of their territorial and political relationship. Drawing on diplomatic and military histories, we have attempted to identify both the time periods of rivalry and the identity of challengers and their rivals based on the identification of salient historical events and claims made publicly by challengers against their rivals. For example, the Anglo-French rivalry begins in 1882, following the British armed intervention in Egypt, which led the French to compete vigorously with the English over colonial territories in Africa. The rivalry ended in 1904 with the signing of the entente agreement that settled the outstanding colonial issues between the two powers (Albrecht-Carrie 1958). We recognize the difficulty in selecting an exact starting or ending year for a rivalry. However, for any empirical analysis, specific years have to be chosen, and our results are not sensitive to slight changes in these beginning and end dates. Our list of Great Power rivals, the period of the rivalry, and the state(s) that we have designated as the challenger is contained in Table 1.[19]

Two different types of rivalries may be distinguished in Table 1. In the first, the rivalry centers on competing Great Power claims to one another's national territory (e.g., French claims to German control over Alsace-Lorraine after 1870). In the second, Great Powers compete over spheres of influence in third-party areas. As a result, the challenger's threat is often not directed at the rival itself but at territories and states that the rival deems important. For example, Anglo-Russian rivalry in the 19th century focused on competition over Turkey, Iran, and Afghanistan.

Insofar as is possible, we identify rivalries whose outcomes (i.e., militarized dispute/no dispute) are independent of one another. An analysis of tightly interconnected rivalries would affect the standard errors of our pa-

19. The designation of the rival is based on the challenger's perception of which countries are likely to oppose its attempt to overturn the status quo, not whether the rival itself actually intended to oppose the challenger's advances.

TABLE 1
Great Power Rivalries 1816-1975

Dyad	*Challenger*	*Dates*
Britain - Russia	Russia	1829-1907[a]
Britain - Germany	Germany	1898-1939[b]
France - Austria-Hungary	France	1848-1861[c]
Prussia - Austria-Hungary	Prussia	1850-1866[d]
France - Prussia/Germany	France	1867-1914[e]
Germany - France	Germany	1898-1939[f]
France - Britain	France	1882-1904[g]
Austria-Hungary - Russia	Austria-Hungary	1878-1914[h]
Germany - USSR	Germany	1933-1941[i]
Japan - Russia	Japan	1895-1945[j]
Italy - Britain	Italy	1923-1940[k]
Italy - France	Italy	1923-1940[l]
Japan - Britain	Japan	1923-1941[m]
Japan - United States	Japan	1923-1941[n]
USSR - United States	USSR	1946-1975[o]
United States - USSR	United States	1946-1975[p]
People's Republic of China - United States	P.R.C.	1950-1975[q]
People's Republic of China - USSR	P.R.C.	1963-1975[r]

a. The potential threat of the challenger is targeted at Britain, Turkey, Iran, and Afghanistan.
b. The potential threat of the challenger is targeted at Britain, and Tanzania.
c. The potential threat of the challenger is targeted at Austria-Hungary, and the Kingdom of Sardinia.
d. The potential threat of the challenger is targeted at Austria-Hungary.
e. The potential threat of the challenger is targeted at Prussia/Germany.
f. The potential threat of the challenger is France and French colonies until WWI, and at France only after WWI.
g. The potential threat of the challenger is targeted at Britain, Egypt, Sudan, and Nigeria.
h. The potential threat of the challenger is targeted at Russia, the Balkan Countries, and Turkey.
i. The potential threat of the challenger is directed at the USSR, and Czechoslovakia.
j. The potential threat of the challenger is targeted at Russia, Mongolia, Manchuria, and Korea.
k. The potential threat of the challenger is targeted at Britain, Ethiopia, Kenya, British Somaliland, Greece, and Malta.
l. The potential threat of the challenger is targeted at France, Austria, Tunisia, and Algeria.
m. The potential threat of the challenger is targeted at Britain, China, the Dutch East Indies, Brunei, and Malaya.
n. The potential threat of the challenger is targeted at the United States, China, and the Philippines.
o. The potential threat of the challenger is targeted at the United States, the NATO countries, West Berlin, Japan, South Korea, Israel, and Iran.
p. The potential threat of the challenger is targeted at the Warsaw Pact Countries, Cuba, North Vietnam, and North Korea.
q. The potential threat of the challenger is targeted at the United States, South Vietnam, and Taiwan and the offshore islands.
r. The potential threat of the challenger is targeted at the USSR.
SOURCES: (Adamthwaite 1977; Carr 1953; Albrecht-Carrie 1958; Kennan 1958; Langer 1935, 1952; Mowatt 1927; Marks 1976; Parker 1969; Taylor 1954, 1961).

rameter estimates by including instances of peace or conflict that are caused not by the conditions and relationships within one rivalry, but by the behavior in another rivalry. One might, for instance, consider Germany and Russia to have been rivals prior to World War I. However, we believe that German-Russian "rivalry" was linked to the rivalry between Russia and Austria-Hungary through the German alliance commitment to Austria-Hungary. Germany and Russia were unlikely to get into a dispute unless there was a prior dispute between Russia and Austria-Hungary. This does not imply, however, that we should ignore Germany, as both Russia and Austria-Hungary considered the likelihood of German support for its Austrian ally. We incorporate this influence by including German capabilities in our measures of systemic and dyadic power distributions.

B. OPERATIONALIZATION OF THEORETICAL MODEL

The theoretical model that we have laid out previously is summarized in the following equation:

Conflict Initiation = System Uncertainty × Risk Propensity + Dyadic Power Relationships + Current and Past Dispute Behavior + Possession of Nuclear Weapons.

The remainder of this section will be devoted to the specific operationalization of these concepts.

Conflict Initiation

The dependent variable is coded as a 1 if the designated challenger(s) is the first state in a dispute to threaten or resort to the use of force against its rival (and protege[s] where relevant as identified in Table 1) in a given year, and 0 otherwise. We exclude all dyad-years in which the challenger is involved in an ongoing dispute or war with the rival that was initiated in a previous year and continued for more than half of the current year. A militarized dispute is defined as the issuance of a demand coupled with a threat of force. The threat of force may be a verbal statement and/or military action such as placing forces on alert, the buildup, concentration, or movement of military forces near the border or off the coast of the targeted state, or partial or full mobilization of forces (Huth 1988, 23; also see Gochman and Maoz 1984). We code the dependent variable based primarily on data in the updated Correlates of War (COW) Militarized Dispute Data Set.[20]

20. In order to guard against the inclusion of border incidents and other minor non-government sanctioned conflicts, we have excluded from the analysis cases in which the challenger did not issue an explicit military threat or make a show of military force (COW level 2).

System Uncertainty

We use five indicators in order to fully operationalize system uncertainty. As each of these indicators increases, system uncertainty increases as well.

1. Number of Great Powers. Great Powers are identified based primarily on the work of Small and Singer (1982) and Levy (1983). Our list of Great Powers between 1816 and 1975 is as follows:

Great Britain	1816-1945
France	1816-1940
Russia/Soviet Union	1816-1975
Austria-Hungary	1816-1918
Prussia/Germany	1816-1945
Italy	1860-1943
United States	1899-1975
Japan	1895-1945
China	1950-1975

2. Number of clusters. Clusters of states are calculated in a manner similar to Bueno de Mesquita (1975). We use Tau_b (an ordinal measure of association which varies 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. States not participating in any international alliances in a year form their own cluster.[21] Data on alliances in the international system are collected from the Singer and Small (1966, 1969) revised data set on alliances from 1816 to 1980.

21. Our procedure differs from that of Bueno de Mesquita (1975) in four ways. First, we do not include all alliance ties to measure similarity. We are only interested in major-minor alliances that are relevant for relations among Great Powers. Accordingly, we calculate similarity based only on major-major and major-minor alliances that are directed at other Great Powers or their interests. Second, we count the shared absence of alliance ties to a third country as indicating similarity only when that third party is a Great Power. Typal analysis performed on a data set of all alliances increases the similarity between any two countries when neither has an alliance tie to a particular third country. Shared nonalliance ties have many different meanings that are difficult to sort out; we have attempted to minimize the problem of inflated similarity scores by counting only mutual nonalliance ties with other Great Powers. Third, we create a similarity matrix of only Great Powers rather than of all states on which to perform typal analysis. Given our definition of system structure, minor powers should not be included in identifying the poles in the system. Finally, we modify typal analysis by assigning a state to a cluster only if all of its similarity scores with other cluster members are greater than 0. By specifying a threshold, we are asserting that states must have some common security interests ($Tau_b > 0$) with all other cluster members in order to be considered part of that cluster.

3. Diffusion of capabilities across states. The diffusion of military capabilities is measured across three categories: total manpower, military spending, and spending per soldier.[22] (Spending per soldier is taken as a very rough measure of the quality of the troops.) We determine the proportion of total Great Power capabilities that each state has for each of these categories and then calculate the average proportion of capabilities across the three categories for each state. These proportions are aggregated across the Great Power system through the use of the concentration index developed by Singer, Bremer, and Stuckey (1972). The concentration index ranges from a minimum of 0 when the distribution of capabilities is perfectly equal between actors to a maximum of 1 in the case where one of the actors in the system controls all of the capabilities. We then convert the concentration of capabilities into the diffusion of capabilities by setting diffusion equal to 1 minus the concentration index.

4. Diffusion of capabilities across clusters. We calculate the diffusion of capabilities among alliance clusters in the system by using the converted concentration index as discussed above. In this case, however, alliance clusters are counted as the poles in the system, and each cluster's capabilities are discounted by the level of alliance tightness among its members. For each group, the tightness of the cluster is computed as the average of the similarity scores between each pair of its members (Bueno de Mesquita 1975). Because the similarity scores among cluster members range from 0 to 1 they may be understood as a rough approximation of the probability that one state will come to the aid of another in the event of conflict; the average tightness of a cluster should therefore be understood as an estimate of the probability that all allies will come to one another's aid in the event of an attack.[23]

5. Cross-cutting alliance ties between clusters. Our measure of the cross-cutting alliance ties in the international system is similar to the Bueno de Mesquita (1975) measure of discreetness. Specifically, our measure of cross-cutting alliance ties is equal to the average of all intercluster alliance pattern similarity scores plus 1, resulting in variable that ranges from 0 to 2.

22. Data on manpower and spending levels have been taken from the COW National Capabilities Data Set. We do not include the demographic and industrial capabilities components of the COW data set because previous work (Huth 1988; Mearsheimer 1983; Anderson and McKeown 1987) indicates that attacker decisions to risk or resort to war are based largely on calculations of whether victory can be attained in a relatively quick and intense armed conflict.

23. Cluster tightness has an effect on system uncertainty only in combination with the distribution of capabilities between clusters. Contrary to Bueno de Mesquita (1975), we feel that the average level of tightness across the system has little meaning. However, a particular loose cluster will generate more uncertainty concerning the likely behavior of its members in the event of conflict than will a tight cluster.

TABLE 2
Factor Analysis on System Variables

Variable	*Factor Loadings on System Uncertainty 1 (System Size)*	*Factor Loadings on System Uncertainty 2 (Capability Diffusion)*
Number of Great Powers	0.881	0.264
Number of clusters	0.822	0.203
Average alliance tightness across clusters	0.923	–0.139
Diffusion of power across Great Powers	0.055	0.883
Diffusion of power across clusters	–0.445	0.719

NOTE: Obtained from oblimin rotation in order to allow for correlation between the factors. Correlation between factors is –.07. Sensitivity analysis using varimax and other rotations produced no significant changes in the factor loadings.

Ideally we would include separate indicators for each of these aspects of system uncertainty. Unfortunately, a high level of multicollinearity among these variables requires us to combine them into two composite measures of system uncertainty through the use of factor analysis (see Table 2). The use of factor analysis is quite appropriate in this case as the best method to reduce multicollinearity among theoretically well articulated concepts. Uncertainty factor 1 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. Uncertainty factor 2, on the other hand, is composed almost exclusively of the concentration of capabilities across major powers and alliance clusters. These factor scores are z scores ranging from approximately –3 to 3. In order to ease interpretation of the coefficients, we transform them by setting their minimum values equal to zero. We will refer to these transformed factor scores as "System Uncertainty 1 (System Size)" and "System Uncertainty 2 (Capability Diffusion)." System Uncertainty 1 ranges from 0 to 4.01, and System Uncertainty 2 ranges from 0 to 5.64.

Risk Propensity

Our operationalization of risk propensity combines the individual and situational components into a single measure. We specify three sources of risk-acceptant behavior, and if *any two* of these three factors are found to be present, then the decision makers in that state are coded as risk acceptant. If none or only one of these factors are present, decision makers are coded as

risk averse. Given the limitations of available data, we are forced to rely on crude measures of the concept of risk propensity. Because of the problems of measurement error, we think that it would be inappropriate either to code the variable on the basis of only one indicator, or to require that all three indicators agree in identifying risk-acceptant actors. This coding rule results in an approximately even distribution of risk-averse and risk-acceptant challengers.

The first source of risk-acceptant behavior, the individual aspect of risk propensity, is operationalized according to the logic and procedures used by Bueno de Mesquita (1981a).[24] This measure uses a state's "expected utility for conflict," which is a function of both the relative capabilities of states and their allies, and the similarity of alliance ties between states. If a state has a positive expected utility for conflict against less states than have positive utility against it, it is coded as risk acceptant, and otherwise is coded as risk averse.[25]

Our second and third risk factors emerge from prospect theory (Kahneman and Tversky 1979; Quattrone and Tversky 1988). The risk attitude of elites depends not only on individual characteristics, but also on whether decision makers are likely to perceive that they are in the domain of losses or gains. We suggest that decision makers perceive themselves in the domain of losses or gains based on two variables: (1) the relative industrial-military position of their country compared to its rival and (2) the domestic political conditions within their country. The deterioration of a state's relative industrial-military position causes national elites to frame decisions from the domain of losses because, in the absence of conflict, elites know that they will value next year's power position less than they value this year's power position. Domestic political conditions can lead elites to frame decisions from the domain of losses when they feel that their internal power position is weakening, making them vulnerable to being removed from office (by elections or other means). The four indicators we use to capture these two variables are as follows:

1a) Relative industrial growth. An index of production incorporating all industries that provide a critical base for military capabilities has been

24. We recognize, as does Bueno de Mesquita (1981a), that alliance patterns are a crude indicator of individual risk propensities, but we know of no better general measure that could serve as a substitute. See Morrow (1987) for a critique of using alliance patterns as a measure of risk attitudes.

25. We alter Bueno de Mesquita's (1981a) procedure by only calculating expected utility for conflict against other Great Powers. We also recognize that Bueno de Mesquita and others have developed more sophisticated measures of risk propensity, but we are unable to combine this newer interval measure with our categorical indicators of situational risk propensity.

constructed for each Great Power. The index includes iron and steel production and energy consumption for all years. In addition, oil production is added in 1900 and aluminum production is added in 1930.[26] We calculate the average rate of growth across these industries for each state during each year and then subtract the rival's growth rate from that of the challenger. Three-year moving averages are calculated, and if the challenger's moving average relative growth rate is negative, then a value of 1 is coded and 0 otherwise.[27]

1b) Relative military growth. We use very similar procedures to calculate an index of relative military growth. Three-year moving averages are examined for trends in the annual growth of manpower, military spending, and spending per soldier. If the relative moving average figure is negative, a value of 1 is coded and 0 otherwise.

If either the relative industrial or relative military growth variable is coded as a 1, the second risk variable (risk attitude from relative military-industrial growth) is coded as 1, and 0 otherwise.

2a) Economic growth. Economic growth has often been used to measure levels of internal public dissatisfaction with the performance of elites (e.g., James 1988; Domke 1988). Simply measuring a state's annual level of economic growth, however, does not adequately tap the level of mass support for the regime, because different nations are accustomed to differing levels of growth. Consequently, our measure of economic growth compares the current year's growth rate with a three-year moving average of annual growth rates. If the current year's rate is 50% or more below the moving average, then a value of 1 was coded, and 0 otherwise.[28]

2b) Strike activity. The annual number of strikes and labor days lost due to strikes are two other measures of mass dissatisfaction with elite performance. Our measure of annual strike activity is calculated in a manner quite similar to our estimation of growth rates. The annual number of strikes and

26. Data on industrial production and energy consumption is collected from the COW National Capabilities Data Set, Mitchell (1980, 1982).

27. Our conception of risk propensity requires us to identify a status quo point from which we can determine the domains of losses and gains. The status quo point with regard to this variable is where the challenger maintains a rate of industrial growth equal to its rival's. In the next variable the status quo point is where the challenger maintains a rate of military growth equal to that of its rival. We also conduct sensitivity analysis using two- and five-year moving averages.

28. Again, we conduct sensitivity analysis using two- and five-year moving averages. The status quo point for both the level of economic growth and the following variable, strike activity, is equal to the average rate of growth and incidence of strikes over the past three years.

labor days lost are compared to a three-year moving average level of strike activity. 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.

If either the economic growth or strike activity variable is coded as a 1, the third risk variable (risk attitude from domestic conditions) is coded as a 1, and 0 otherwise.

We interact the above indicator of risk propensity with System Uncertainty 1 (System Size) and System Uncertainty 2 (Capability Diffusion). We also include risk propensity by itself in the equation so as not to constrain artificially all actors in the system to have an equal probability of conflict initiation at the lowest (0) level of system uncertainty.

Dyadic Balance of Military Capabilities

This variable measures the ratio of the challenger's capabilities to the total capabilities of the challenger and rival (in effect, estimating of the probability of victory in a war). The measure combines both the individual capabilities of the challenger and the rival and the support they expect to receive from the other Great Powers in the system. Individual states' capabilities are measured as discussed previously, with the addition that they are discounted for the distance to the likely point of conflict in any year (identified in Table 1) using the method described by Bueno de Mesquita (1981a). If there are multiple points of possible conflict, we take the average of the distance to those points. We estimate the expected support of third states for the challenger and the rival by discounting the capabilities of each third state both by the alliance similarity score between that state and the challenger or rival and by the distance from the third state to the point of potential conflict.

Arms Race

This variable sums the proportional growth in military expenditures of the challenger and rival states over the previous three years.

Past Behavior of the Rival

This variable is coded 1 if either the rival suffered a diplomatic put-down from the challenger or the rival failed to respond to a threat by the challenger within the past 3 years. The coding procedures used by Huth (1988, 68-71) are employed to code whether the challenger suffered a diplomatic putdown.

The COW project's Militarized Dispute Data Set is used to identify the past disputes of the challenger with the rival.

Preventive Motive

The individual indicators for the preventive motive variable are the same two indicators that in combination measure the aspects of risk propensity created by the challenger's military and industrial position relative to that of the rival. Although the same operational measures are used, they nevertheless tap two different theoretical concepts. First, we are arguing that adverse international power conditions lead to perceptions of being in the domain of losses for decision makers, which in turn leads to risk-acceptant behavior. In this context, these two measures serve only as indicators of risk propensity. Second, we also argue that within a rational cost-benefit calculation the presence or absolute magnitude of an unfavorable international position should affect choices about initiating militarized disputes. These four indicators are used, then, to test distinct theoretical arguments about the interactive and independent effects of the same variables.

Two different operational procedures are applied to the industrial and military growth indicators to test preventive motives. First, the relative growth rate figures are not transformed into a dummy variable as they were when used as indicators of risk propensity. Second, the growth rates are interacted with a dummy variable that marks when the challenger state is currently ahead of the rival in the dyadic balance of military capabilities (excluding third parties). These composite variables measure when the challenger's current position of advantage is eroding.

Power Transition

The power transition variable is a dummy variable that is coded 1 when both (1) either the challenger's or rival's military expenditures are growing 10 percentage points faster than its opponent's, and (2) the ratio of military capabilities between challenger and rival (excluding third parties) is between 3:4 and 4:3. A value of zero is coded otherwise.

Current Dispute Involvement of Challenger

This variable is coded 1 if either the challenger is involved in a militarized dispute or war with a third party during the current year. The COW data sets on international and extrasystemic wars and militarized disputes are used to identify involvement in disputes and wars.

Current Dispute Involvement of Rival

This variable is coded 1 if the rival is involved in a militarized dispute or war with a third party during the current year. The same COW data sets as identified immediately above are used.

Rival Possession of Nuclear Weapons

This variable is coded as a dummy, with a value of 1 if the rival of the challenger possesses the capability to deliver nuclear weapons to the national territory of the challenger and 0 otherwise.

In conclusion, the completely specified operational equation to be tested by the probit analysis is as follows:

Conflict Initiation = c
+ b_1 (System Uncertainty 1: System Size)
+ b_2 (System Uncertainty 2: Capability Diffusion)
+ b_3 (System Uncertainty 1 × Risk Propensity)
+ b_4 (System Uncertainty 2 × Risk Propensity)
+ b_5 (Dyadic Balance of Forces)
+ b_6 (Arms Race)
+ b_7 (Past Behavior of Rival)
+ b_8 (Preventive Motive Industrial)
+ b_9 (Preventive Motive Military)
+ b_{10} (Power Transition)
+ b_{11} (Challenger Current Dispute Behavior)
+ b_{12} (Rival Current Dispute Behavior)
+ b_{13} (Nuclear Weapons)
+ b_{14} (Risk Propensity)
+ u_t

DATA ANALYSIS

The equation listed above was tested by probit analysis on a pooled time series of rival Great Power dyads.[29] The results are presented in Table 3.

29. After having combined the system-level variables into two composite factors, we ran auxiliary regressions and found that multicollinearity among the independent variables is no longer a problem. Because we are using time series data, autocorrelation of the errors is also an important potential problem. Unfortunately, we know of no way to correct for autocorrelation in a probit model. We did, however, estimate our equation using ordinary least squares and found that the Durbin-Watson statistic indicated that first order autocorrelation is not present. Because

TABLE 3
Results of Probit Model of Dispute Initiation

Variable	*Coefficient*	*Asymptotic Standard Error*	*Asymptotic t ratio*	*Estimated Significance Level (464 df)*
Constant	0.897	0.695	1.291	–
System uncertainty 1 (size)	–0.175	0.165	–1.060	< .145
System size × risk propensity	0.299	0.169	1.769	< .038
System uncertainty 2 (diffusion)	–0.399	0.099	–3.994	< .000
System diffusion × risk propensity	0.293	0.146	2.009	< .023
Dyadic balance of forces	–0.379	0.621	–0.610	–
Arms race	0.259	0.112	2.304	< .011
Preventive motive (military)	0.0001	0.165	0.0008	–
Preventive motive (industrial)	–0.077	1.470	–0.525	–
Power transition	0.370	0.180	2.052	< .020
Rival backed down in previous dispute	0.652	0.188	3.467	< .000
Challenger in another dispute	–0.225	0.151	–1.498	< .068
Rival in another dispute	0.025	0.148	0.166	–
Rival possesses nuclear weapons	0.099	0.328	0.261	–
Risk propensity	–1.861	0.711	–2.617	< .005

NOTE: $N = 479$.

The general conclusion that we draw from the results is that system structure alone does not provide an adequate explanation of the conflict behavior of Great Powers, contrary to the arguments of many scholars and the centrality of structural realism to international relations theory. The results show that the structure of the international system has a statistically significant impact on the conflict behavior of states, but several control variables from the dyadic- and unit-level have significant effects as well. Further, the substantive effects of systemic and nonsystemic variables are quite comparable.

The overall ability of our model to forecast the likelihood of dispute initiation is presented in Figure 3 and in Table 4. Rather than a simple 2 × 2 table predicting dispute initiations, Figure 3 is a calibration table that is often used in analyses of decision-making accuracy (Yates 1990) because it gives us much more specific information about the performance of our model. This table summarizes the correspondence between the predicted probabilities

using ordinary least squares biases our results, and because our errors may be correlated both across space and time, this test should not be considered conclusive. Nonetheless, it suggests that autocorrelation does not present a serious problem.

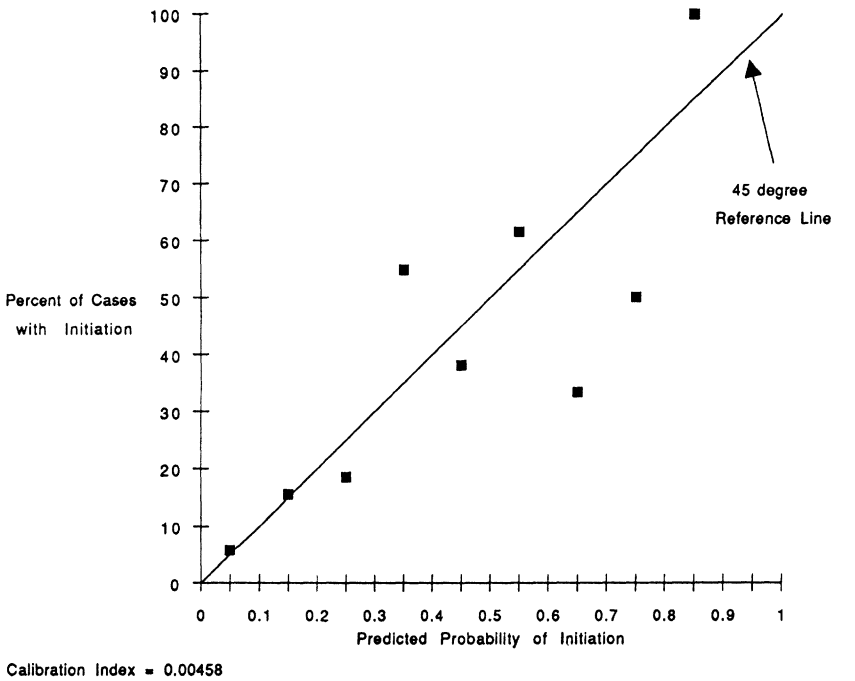

Figure 3: Calibration Table: Probability Actual Initiation by Predicted Probability

that a target event will occur and the actual frequencies with which the event takes place. Perfect calibration would be represented by a 45 degree upward sloping diagonal line from the origin and a calibration index score of 0. Conversely, the worst possible level of calibration would be represented by a downward sloping diagonal line and a calibration index score of 1.[30] Our calibration line's slope is slightly less than 45 degrees, reflecting the fact that our model tends to underpredict the initiation of disputes. If one takes the parameter estimates in Table 3 and sets the variables to their mean values, our model predicts slightly less than a 14% probability of initiation. In our data set, initiations actually comprise approximately 18% of the cases. Nonetheless, the fit between our forecast probabilities and the actual fre-

30. The formula for the calibration index is: CI = SUM(CI_j)/N, where CI = Calibration Index, N = number of total observations, and $CI_j = N_j(f_j - d_j)^2$; where f_j = the forecast likelihood of the target event in category j, d_j = the actual frequency of target event in category j, and N_j = the number of observations in category j.

quency of disputes is quite good, and the calibration index is only 0.0046. Table 4 provides a more detailed breakdown of the fit between our forecast probabilities and the actual frequencies of dispute initiation.

If we look at the parameter estimates in Table 3 we find that risk-averse and risk-acceptant actors react to the uncertainty in the international system in significantly different ways, as proposed in hypotheses 1 and 2. Contrary to our expectations, however, for both risk-averse and risk-acceptant actors, increased Capability Diffusion (System Uncertainty 2) is correlated with a lower probability of dispute initiation. Nonetheless, it is important to note that this effect is significantly more pronounced for risk-averse actors; that is, increases in Capability Diffusion lead to a greater decrease in the probability of conflict initiation for risk-averse than for risk-acceptant decision makers.

In examining the results presented in Table 3, the differing reactions of risk-acceptant and risk-averse actors to the level of uncertainty in the system are designated by the opposing signs of the coefficients concerning system uncertainty alone and uncertainty's effect on risk-acceptant actors. The effect of system uncertainty on risk-averse actors is given by the coefficients on "System Uncertainty 1" and "System Uncertainty 2." The effect of system uncertainty on risk-acceptant actors can be calculated by adding the coefficients on the system uncertainty variables to their interactions with risk acceptance. The net effect of varying the level of uncertainty on both risk-acceptant and risk-averse actors is illustrated in Figures 4 and 5. As System Size increases, for example, risk-averse actors become less likely to initiate a militarized dispute whereas risk-acceptant actors become marginally more likely to initiate a conflict. Surprisingly, when System Size is at very low levels, risk-averse actors are more likely than risk-acceptant actors to initiate a dispute.[31] As uncertainty increases, however, risk-acceptant

31. We can think of two possible explanations for this unexpected finding, reflected in the negative coefficient on the risk propensity variable alone. First, given Bueno de Mesquita's (1981a) operationalization of risk propensity, one might expect that powerful actors would tend to be coded as risk averse, making them more likely to initiate a conflict. If this was the case, however, we would have expected that the coefficient for the dyadic balance or military forces to be significant as well. Second, our domestically based indicator of the domain of losses may be measuring two concepts simultaneously: (1) risk acceptance, and (2) high internal political costs from conflict. It is possible that the levels of internal unrest are so high in the cases that we identify that the traditional "rally 'round the flag" effects associated with confronting an external enemy can no longer be counted on. As a result, conflict initiation by the challenger is actually less likely under these conditions. To test for this effect we should have included alone as independent variables in the equation indicators of domestic political unrest. Due to limited data, however, we were unable to do so (see note 18).

(text continues on p. 510)

TABLE 4

Contingency Table, Actual Dispute Initiation by Predicted Probability of Dispute Initiation

	Predicted probability of initiation, p									
	0 < ≤ p < ≤ .1	*.1 < p ≤ .2*	*.2 < p ≤ .3*	*.3 < p ≤ .4*	*.4 < p ≤ .5*	*.5 < p ≤ .6*	*.6 < p ≤ .7*	*.7 < p ≤ .8*	*.8 < p ≤ .9*	*Row Total*
Actual initiation										
No	149	142	66	14	13	5	2	1	0	392
	(94.3)	(84.5)	(81.5)	(45.2)	(61.9)	(38.5)	(66.7)	(50.0)	(0)	(81.8)
Yes	9	26	15	17	8	8	1	1	2	87
	(5.7)	(15.5)	(18.5)	(54.8)	(38.1)	(61.5)	(33.3)	(50.0)	(100)	(18.2)
Column total	158	168	81	31	21	13	3	2	2	479
	(33.0)	(35.1)	(16.9)	(6.5)	(4.4)	(2.7)	(.6)	(.4)	(.4)	(100)

NOTE: Upper number in cell represents the number of cases. Lower number (in parentheses) represents the percentage of cases of that predicted range.

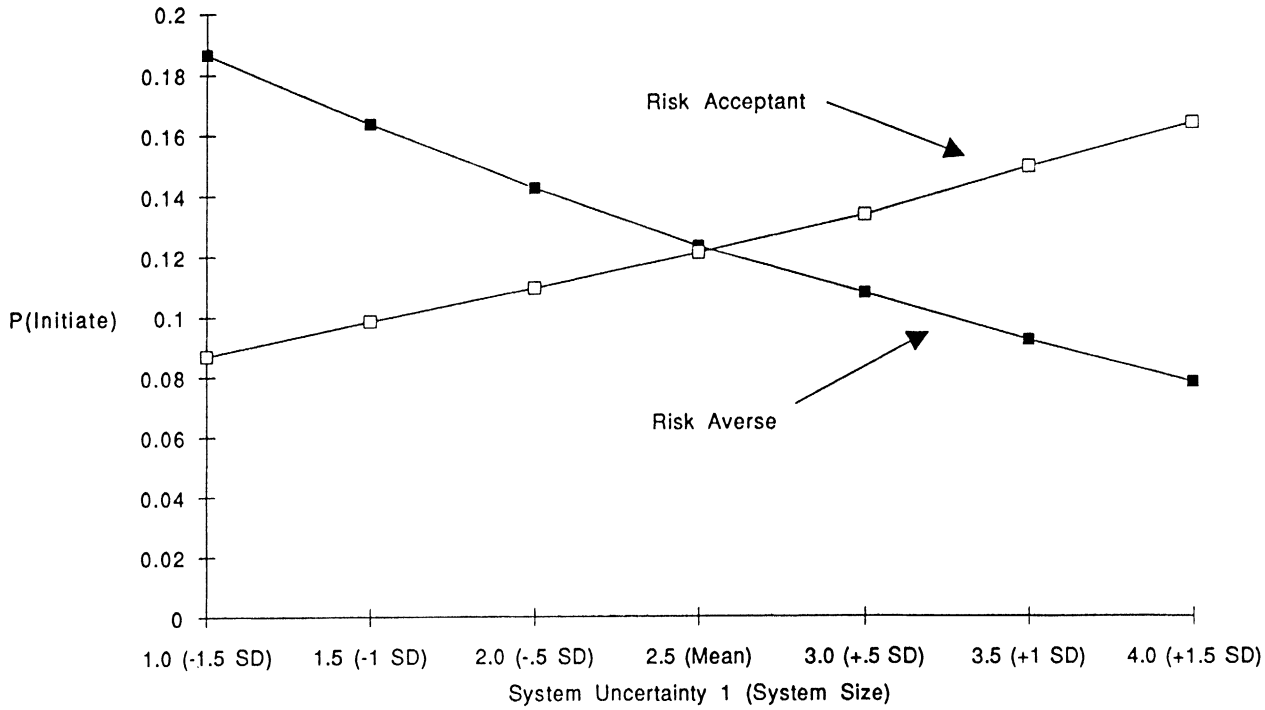

Figure 4: Effect of Increasing System Uncertainty 1 (System Size), Other Variables Held at Means

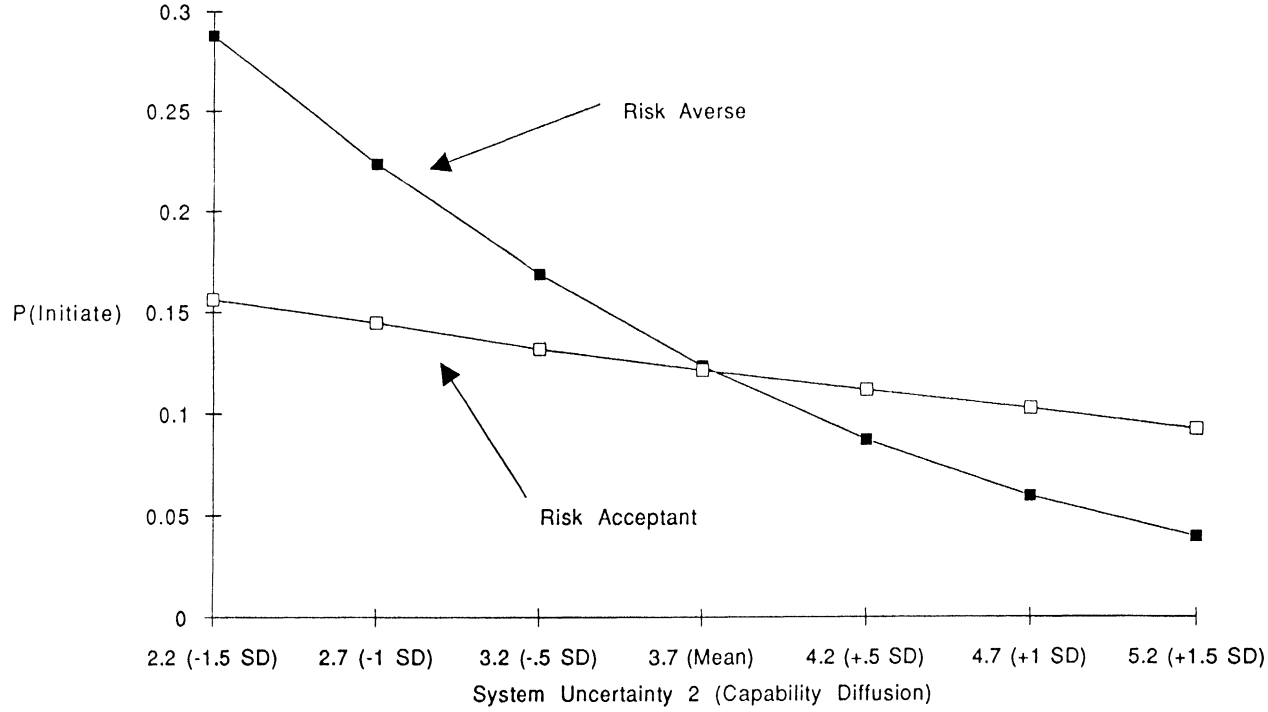

Figure 5: Effect of Increasing System Uncertainty 2 (Capability Diffusion), Other Variables Held at Means

decision makers change their behavior very little, whereas the probability that risk-averse actors will initiate a dispute drops off sharply. Consequently, when System Size is at high levels, risk-acceptant actors are *more* likely to initiate militarized disputes than are risk-averse decision makers. Increases in Capability Diffusion have a consistently negative effect on the likelihood that decision makers will initiate a dispute, but this effect is much sharper for risk-averse decision makers. The marginal effects of the systemic variables are displayed in sections A and B of Table 5.

The combination of the five different indicators of system uncertainty into two composite factors make a straightforward interpretation of the impact of the original variables difficult. Nonetheless, it is possible to gain a sense of the real-world effects that these factors summarize. As mentioned earlier, uncertainty factor 1 is comprised largely of the number of Great Powers, the number of alliance clusters, and the similarity of alliance patterns across those clusters. Consequently, as the number of Great Powers in the system, the number of alliance clusters and the average alliance similarity across clusters increases, the probability of dispute initiation will decrease for risk-averse actors at the rate depicted in Figure 4. Risk-acceptant decision makers become slightly more likely to initiate disputes as these three components of System Size increase. Similarly, uncertainty factor 2 is comprised largely of the concentration of capabilities both across the major powers and across alliance clusters. Thus as capabilities become more widely diffused across the major powers and alliance clusters, the probability of dispute initiation will decline both for risk-acceptant and risk-averse actors at the different rates depicted in Figure 5.

Although the system-level variables represent the main focus of our discussion, the results also suggest that dyadic- and unit-level variables affect conflict initiation. The marginal effects of these variables are summarized in section C of Table 5. As hypothesized, two of our dynamic measures of relative military capabilities, arms races and the power transition, have a positive and significant effect on dispute initiation by the challenger. During a power transition, for example, the probability of dispute initiation increases by 9.5%. Similarly, as one moves from a situation in which neither country is increasing its military expenditures (a value of 0 for our arms race variable) to one in which each side is doubling its expenditures (a value of 2), the probability of dispute initiation increases by approximately 13%. We find little support, however, for the argument that preventive incentives outside of a situation of near parity make a significant contribution to the outbreak of conflict. Nonetheless, we should note that the coefficient for the preventive

TABLE 5
Marginal Effects of Statistically Significant Variables on Probability of Dispute Initiation: All Other Variables Held at Mean Values

a. System-Level Variables—Risk-Acceptant Actors	
System Uncertainty 1	*Change in Probability of Dispute Initiation*
Minimum (0)	
	+5.5%
Mean (2.5)	
	+4.3%
Maximum (4)	
System Uncertainty 2	*Change in Probability of Dispute Initiation*
Minimum (0)	
	–9.6%
Mean (3.7)	
	–3.6%
Maximum (5.6)	
b. System-Level Variables—Risk-Averse Actors	
System Uncertainty 1	*Change in Probability of Dispute Initiation*
Minimum (0)	
	–11.6%
Mean (2.5)	
	–4.7%
Maximum (4)	
System Uncertainty 2	*Change in Probability of Dispute Initiation*
Minimum (0)	
	–51.1%
Mean (3.7)	
	–9.9%
Maximum (5.6)	
c. Dyadic- and Unit-Level Variables	
Power Transition	*Change in Probability of Dispute Initiation*
No	
	+9.5%
Yes	

(continued)

TABLE 5 Continued

Challenger in Other Dispute	*Change in Probability of Dispute Initiation*
No	
	–4.2%
Yes	
Joint Increase in Arms Expenditures?	*Change in Probability of Dispute Initiation*
0%	
	+5.9%
100%	
	+7.5%
200%	
	+18.9%
400%	
Target Previously Backed Down	*Change in Probability of Dispute Initiation*
No	
	+18.8%
Yes	

motive indicator based on trends in relative industrial growth is in the expected negative direction. Surprisingly, the coefficient for the dyadic balance of forces variable is not significant. One explanation of this finding may be that our selection of Great Power rivalries as the unit of analysis may have minimized the impact of this variable by selecting out cases in which the potential challenger faces such an unfavorable balance of forces that a militarized rivalry never emerges.

We also find that both current and past dispute behavior are important explanatory variables in our model. As hypothesized, if the challenger is engaged in a dispute outside the rival dyad, the probability that it will initiate a dispute against its rival decreases by over 4%. Although the rival's involvement in disputes outside the dyad does not have a statistically significant effect, the coefficient is in expected positive direction. However, as hypothesized, the rival's past dispute behavior toward the *challenger* appears to have a strong effect on the challenger's decisions whether to initiate. Specifically, if the rival has backed down or failed to respond to a threat by the challenger within the previous three years, the probability that the challenger will initiate again increases by over 18%.

Another interesting finding is that the rival's possession of nuclear weapons does not deter the challenger from initiating disputes. Not only is the coefficient for this variable statistically insignificant, but its substantive size is very small and it is in the wrong direction. One should remember, however, that many of these cases are what could be referred to as extended general deterrence situations (Huth 1988, 17). One could argue plausibly that nuclear weapons are likely to be of limited use in such situations, either because the rival's nuclear threat lacks credibility or because the challenger may probe the rival's resolve by initiating a dispute without running the immediate risk of escalating the crisis to a nuclear war.

CONCLUSION

The primary conclusion of this article is that system-level theories of international conflict behavior provide some – but we think limited – insight regarding the behavior of Great Powers. We find that system-level variables are consistently statistically significant, even while controlling for a variety of dyadic- and unit-level variables. At the same time, system-level explanations for international conflict do not overwhelm dyadic- and unit-level variables, which have comparable substantive effects.

In particular, our empirical results partially support the hypotheses of both Bueno de Mesquita and Deutsch and Singer regarding the impact of the system on international conflict. The fact that system uncertainty interacted with risk attitude does affect Great Power conflict initiation supports Bueno de Mesquita's (1978) argument that risk attitude should be taken into account when studying conflict initiation, and particularly when examining the effects of systemic variables on international conflict. However, the argument that system uncertainty should have an effect *only* when interacted with risk is not supported. Increases in system uncertainty have a negative effect on conflict initiation independent of risk attitude, supporting the Deutsch and Singer (1964) argument that multipolar systems are more stable than bipolar ones, at least as far as dispute initiation is concerned.

In contrast, our results do not offer any support to the logic underlying the Waltzian argument that uncertainty in the international system leads to more conflict. Additionally, our findings suggest that Waltz's (1979) definition of system structure is too narrow in its exclusive focus on the number of Great Powers in the system. Uncertainty factors that included the concentration of capabilities across alliance clusters, the number of clusters, and the number of alliance ties crossing cluster boundaries had a statistically significant

impact on the initiation of militarized disputes in the probit analysis. However, it should be emphasized that this study examines only the initiation of militarized disputes, not the escalation of disputes to war or the frequency of Great Power war. It is possible that uncertainty in the international system leads both to more frequent dispute initiation and to less frequent escalation of those disputes into wars.

The results of the analysis further suggest that the use of risk attitude measures based on whether or not decision makers are in the domain of losses can yield fruitful results. It appears that the experimental results of Kahneman and Tversky regarding risk attitude can be extended to an empirical analysis involving historical cases. The results suggest that a risk attitude measure based on these factors can usefully supplement the Bueno de Mesquita (1981a) measure of risk attitude previously discussed. An integrated measure such as we have used is likely to be more sensitive to changes in risk attitude than an examination of solely military capabilities and alliance patterns that change only slowly.

Finally, the results of this article may have important implications for understanding and predicting future international conflict behavior in a rapidly changing European security environment. Our findings do not support the arguments of scholars such as John Mearsheimer (1990) and John Lewis Gaddis (1986), who have emphasized the importance of low levels of system uncertainty in preserving the postwar "long peace" in Europe—at least as far as that peace is measured by dispute initiation. In fact, inasmuch as Europe is becoming multipolar, our findings suggest that militarized disputes among the Great Powers should become less frequent. In addition to impending systemic changes that may deter the outbreak of disputes, our results suggest that many dyadic- and unit-level variables may have equally significant implications for European security.

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