Hot Spots or Hot Hands? Serial Crisis Behavior, Escalating Risks, and Rivalry

Michael P. Colaresi and William R. Thompson
Indiana University

Recently, a debate has begun concerning the relationship between conflict events over time between the same disputants. While research on rivalries and recurrent conflict suggest that crises are related over time, others (Gartzke and Simon 1999) doubt the empirical and theoretical foundations of this research. We agree with the critics that the proposition that conflicts between adversaries are related over time remains only weakly substantiated. To fill this lacuna, we test four hypotheses relating past crisis behavior and sequences to subsequent conflict, using International Crisis Behavior (ICB) project data. Our results support the serial crisis hypothesis and suggest that the probability of subsequent crises and wars increase with each past crisis. Our findings also reinforce the inclination to give more emphasis to the analysis of rivalries.

Over the last decade considerable progress has been made in deciphering the causes of international war and conflict. Theoretical advances have been matched by empirical evidence uncovering, for instance, the democratic peace phenomena. Yet one potentially important research question has gone nearly untouched: How are crises between the same adversaries related to each other, if, indeed, they are? This question is important in its own right: does previous conflict predict future conflict? It also addresses the prevailing tendency to examine conflict events as if they were entirely independent confrontations. If previous conflict predicts future conflict, the independence assumption will be difficult to sustain. Third, the serial crisis question also addresses the very conceptual foundations of rivalry analysis. If previous conflict does not predict systematically to future conflict, an important premise for examining rivalries is eliminated. The problem is that we do not know whether and how past and future conflict are related. We assume that they are related but whether they are remains an interesting empirical question, which has implications for other analytical assumptions.

Most quantitative research on international conflict has treated confrontations between the same set of states as independent events. For example, it is conventional to treat the 1961 U.S.-Soviet Berlin crisis as a separate and distinct case from the 1962 Cuban missile crisis. Equally conventional would be

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to treat the sequences of Egyptian-Israeli or Indo-Pakistani crises as if the latest ones had nothing to do with earlier ones. Methodologically, this convention leads to identifying assumptions for statistical models, while theoretically it guides the explanatory variables upon which researchers rely. The independence assumption steers researchers away from variables that measure the interaction between crises and toward variables that can be applied to each crisis cross-sectionally. In many ways this has furthered research into the relationship between international crises and such variables as regime type, contiguity, and capability ratios, but it is important to realize what might be overlooked—namely, that earlier conflicts may very well have some, and perhaps even considerable, influence on the probability of subsequent confrontations.

One of the more curious facets of this prevailing analytical tendency is that a number of analysts have explicitly assumed otherwise—that is, that conflicts are not temporally independent. McClelland (1961) argued that repeated clashes could reduce both uncertainty and the probability of conflict escalation. Bell (1971) coined the term "crisis slide" for serial confrontations that tend to lead to war. Snyder and Diesing (1977, 19) preferred to leave the situation ambiguous: "Some crises embitter and worsen subsequent relations, others improve them," whereas Lebow (1981, 317) argued that successive crises between adversaries in a short time period "significantly increase international tension and expectation of war." Although his findings are based on a small, selected sample of crises, Leng's (1983) argument that dyads tend to go to war by their third crisis is frequently cited as if it were an established fact about serial crisis behavior. A decade later, Hensel (1994) also found that previous dispute outcomes affected the likelihood of dispute recurrence, but his study was restricted to Latin American militarized disputes. Levy (2000) uses serial crisis behavior as an illustration of a behavioral phenomenon that prospect theory can help explain, while Vasquez (1993, 2000) has incorporated serial crisis behavior as an integral component of his "step-to-war" realpolitik model. In general, many conflict analysts, if surveyed, would probably agree that the proposition that conflict begets more conflict (or, in some cases, conflict management) is one of the things that we have learned in contemporary conflict analyses. Yet the "lesson" remains largely restricted to the realm of assumption.

It has also been recognized that the same pair of states can be involved in multiple disputes and, further, that only a few dyads account for the majority of the total conflict in the international system (Diehl and Goertz 2000; Goertz and Diehl 1992; Vasquez 1993). These observations are in fact one of the primary reasons for the study of rivalries. Rivalries constitute competitive relationships that persist over time, through successive conflictual encounters, and account for a disproportionate amount of the world's conflict. The major implication is that a respectable portion of conflict is largely undecipherable outside of the rivalry context. Yet most conflict studies have proceeded without explicit reference to the ostensibly critical historical context within which events occur. Thus, if rivalry analysts are right, we should anticipate some major advances in our

understanding of interstate conflict thanks to a movement away from the notion that disputes and crises are independent events.

Yet other analysts (most prominently, Gartzke and Simon 1999) have suggested that these temporal linkages in a small number of interstate dyads have largely been assumed and may have occurred simply due to chance. Instead of relying on the counter-assumption that these events are interdependent over time, the rival hypothesis is that other variables, such as regime type or capability ratios, are actually responsible for what only seem to be temporal dependencies. Given the quite narrow empirical basis in support of crisis/dispute interdependence, it is difficult to dismiss this rival explanation out of hand.

The question thus remains whether a dyad's conflict at one time affects the probability of that same dyad's conflict at some later date. If it does, the idea of focusing more specifically on rivalries makes more sense than if it does not. If conflicts within some dyads are not temporally interdependent in some fashion, the very concept of rivalry would have little meaning. Thus, assessing whether there is serial interdependence in conflict behavior is necessary to provide (or to deny) a firm empirical foundation for the prospects of rivalry analysis generating Goertz and Diehl's (2000, 197–98) "dramatic shift in theoretical and methodological perspectives" for international relations research. If conflicts are substantially independent events, history would not seem to matter much. But if some dyads' conflict is temporally interdependent, we would need to rethink the way we treat conflicts as inherently autonomous events.

We agree that that the proposition that conflicts between adversaries are related over time remains only weakly substantiated. Conflict interdependence over time should neither be assumed nor assumed away. Instead, the proposition should be tested empirically. If crises are serially related, conflict propensities should fluctuate systematically with previous behavior. If they are not serially related, previous behavior should exert no systematic influence on subsequent behavior. We also choose to focus upon crises in this analysis, as opposed to some more generic measure of conflict, because it is serial crises and "slides to war" that are thought to be one of the verities of international relations lore. Yet we actually lack a systematic test of whether serial crises have implications for more crises and greater levels of violence.

Therefore, our motivation is dual. We wish to examine crisis behavior over time to test systematically for evidence of conflict interdependence. We do this in part because international relations analysts already assume that serial crisis behavior is one of the established causes of war. We think this idea has not yet been established. We are also interested in utilizing this opportunity to respond to Gartzke and Simon's (1999) challenge of a central rationale for engaging in studies of rivalry behavior. A basic tenet of rivalry analysis is that a respectable portion of dyadic conflict is conditioned historically by previous encounters. This, too, is a largely untested assumption and richly deserves verification.

To accomplish these twin objectives, we first summarize the limited empirical findings on serial behavior in international politics and their linkage to the

study of rivalries. After reviewing the Gartzke and Simon (1999) "hot hands" critique of assumptions about serial influences, several relevant hypotheses are discussed and then tested with 1918–1995 data on crises and other appropriate variables. Our analysis reconfirms the appropriateness of assuming serial influences in crisis sequences, but, at the same time, the findings put the issue on a stronger empirical footing than has been the case so far. Our findings also reinforce the inclination to give more emphasis to the analysis of rivalries. The history of dyadic conflict can make some difference. Most dyads have no history of extensive conflict, but those few that do find it exceedingly difficult to ignore path dependencies of their own making.

The Serial Crisis Hypothesis

Recent empirical scholarship has begun to treat groups of conflicts as the primary unit of analysis in conflict studies. Most often these conflict streams are termed either rivalries or enduring rivalries (Bennett 1998; Diehl and Goertz 2000; Goertz and Diehl 1992; Huth, Gelpi, and Bennett 1993; Leng 2000b; Maoz and Mor forthcoming; Rasler and Thompson 2000; Thompson 1995; Thompson 1999; Vasquez 1996; Wayman 2000). Some choose to define rivalry relationships in terms of their militarized dispute density. If a dyadic conflict sequence exceeds some minimal dispute threshold within a specified period of time, the dyad is considered an enduring one. Others choose to focus on the perceptions of the actors in the relationship. Essentially, if decision makers in two states regard the other state as threatening adversaries, the dyad is considered to be in a rivalry relationship.

The motivation for the rivalry research program stemmed from an intuition that disputes are related over time and empirical findings on the frequency of confrontations within different dyads (Gochman and Maoz 1984). Goertz and Diehl (2000, 222) state that "research on (enduring) rivalries begins with [the] observation: a small proportion of dyads accounts for a very large percentage of all militarized disputes and wars." Vasquez (1993) notes that almost half of all wars in the past 200 years can be traced to fewer than 6% of the total number of dyads in the system. Thompson (2001) pushes this observation even further when he argues that nearly four of every five wars can be attributed to escalation within a small set of rivalries. Some of these particularly crisis-prone dyads are Ecuador and Peru, the United States and the former Soviet Union, Egypt and Israel, India and Pakistan, China and Taiwan, and North and South Korea. As Goertz and Diehl (2000, 222) state, "these repeated conflicts between the same dyad are related to one another, and . . . explaining war requires understanding the relationship between these disputes." Regardless of how one identifies rivalry, it is a historical sequence of competition, threat, and conflict that alerts us to the existence of such a relationship. By definition, therefore, rivalry analysis is predicated on the notion of a sequence of interdependent perceptual and physical clashes.

Leng's (1983) study on serial crises is highly germane to these observations. Examining a sample of 18 crises that took place within 6 dyads, Leng found considerable support for an experiential learning model and the idea that crisis outcomes are related over time. Specifically, the use of a coercive strategy in a previous conflict affects the choice of strategies in a future crisis. As states jockey and bully each other, rather than learning prudence and restraint, Leng argued, leaders learn to use more coercive bargaining strategies. If crisis participants use a coercive strategy successfully, they are more likely to repeat the strategy in the future. If crisis participants are unsuccessful, they are more likely to adopt an even more coercive strategy the next time around. Thus, the greater the number of past crises, assuming some employment of coercive strategies by one or both sides, the more likely are increasingly coercive strategies and war. Only if a crisis initiator lost a war in an earlier round are they likely to move to less coercive strategies. But it is not only previous strategies that are important: their sequence also makes a difference. In fact, by the time a third crisis has occurred between a pair of states, Leng argued, war is highly probable. Still, Leng's sample was too small to allow for a comparison between crisis dyads that did not repeat and those that did. It may be that he simply picked the most war-prone cases.

Hensel (1994) also found support for a relationship between disputes involving the same states. Focusing on Latin American dyads that had experienced militarized disputes, a relatively complex pattern of interactions between disputes emerged. Most important, Hensel found that previous dispute outcomes generally influenced the likelihood and timing of dispute recurrence. For example, a stalemate in the previous dispute lowers the time until a subsequent confrontation by about six years, as compared to decisive outcomes. But Hensel did not examine the disputes as specific sequences that would allow one to say anything about the likelihood of a first or second dispute leading to additional confrontations. All militarized disputes are not crises; nor are Latin American conflict patterns necessarily representative of the rest of the world.

From the available evidence, however limited, multiple researchers have deduced that conflicts between the same adversaries are related over time. Assuming a concrete relationship, there are three possible connections between past and future conflicts: there can be either a positive relationship, a nonlinear relationship, or a negative relationship. The most often cited rationale for crisis dependence is that past crises make future wars more likely. Vasquez (1993, 75) is representative when he writes that wars "do not break out unless there has been a long history of conflict and hostility between disputants." In this view, past conflict increases the influence of hard-liners and hawks on each side while also increasing suspicions between the adversaries. Together, the coevolution of decision makers who are more likely to go to war and perceptions that an adversary is becoming increasingly threatening make a future war more likely.

Alternatively, a more contingent, nonlinear position is possible. Adversarial relations prior to war need not reflect an ever-increasing hardening of positions. If decision makers' choices are constrained by their understandings of what strategies have or have not worked in the past with a particular rival and different strategies are employed in different circumstances, it is possible that rivalry relationships will oscillate over time. Past conflict, therefore, may increase or decrease the propensities for conflict depending on the nature of choices made in the past, but regardless of the specific correlation of events, crises are related to each other, if nonlinearly. This idea is similar to Leng's (1984, 2000a) realist experiential learning model in which the future propensity for war depends on the strategy choice in the past crisis and the success of that choice.

Finally, it is possible that past conflict can make future conflict less likely. McClelland (1961) hypothesized that through repeated crisis interaction with the same adversary, participants gain experience in ways of coping with each other and reduce uncertainty. While threats may still be made, the probability of overt hostilities declines. It is also conceivable that a confrontation will bring about reduced conflict without involving a sequence of learning experiences. This outcome could occur in two different ways. Crisis participants may go to the brink and realize that continuing the conflict is not in either side's best interests. This sentiment could be due to the realization that one side is simply too powerful to resist successfully. The adversaries may realize that they have more in common (such as a mutual enemy) than they have in dispute. Or it could be that the crisis catalyzes a perception that the two parties do not really have much to fight about (Lebow 1981; Rock 1989) and that their adversarial relationship has continued to exist due primarily to perceptual inertia. When decision makers are forced to confront why and what they may be fighting about, as well as the likelihood of limited payoffs in continuing the relationship as in the past, there can be a realization that conflict deescalation is a more attractive option.

These assertions are similar in spirit to the war-weariness proposition whereby states are less likely to go to war with each other after a past war. Toynbee (1954) (see also Blainey 1973; Wright [1942] 1965) maintained that political leaders who have directly experienced the devastation of war will be averse to a future war due to the high costs they have experienced. Whether war weariness should be expected to apply to crisis sequences is debatable. Unlike most crises, wars cause variable destruction and devastation that require periods of reconstruction. Earlier war participants who wish to resume hostilities tend to be handicapped by the need to rebuild their resource base before they go to war again. Crisis participants can usually avoid incurring heavy costs if they end the crisis before the shooting commences. For that matter, the empirical evidence for the war-weariness hypothesis (Goldstein 1988; Levy and Morgan 1986; Singer and Cusack 1980; Singer and Small 1974; Siverson 1980; Stoll 1984) is decidedly mixed. If the weariness linkages between wars are weak, they may be even weaker between crises.

Hot Spots or Hot Hands?

Not all researchers accept that there are relationships between crises over time. Gartzke and Simon (1999) offer a methodological and empirical critique of the serial crisis hypothesis. They note that while states "with histories of disputes are more likely to engage in additional disputes . . . it does not follow, however, that previous disputes are causal (782)." Instead, Gartzke and Simon suggest that other variables should be given priority. For instance, in a series of crises between states, something must have caused the first dispute. The "prime mover" in this case cannot be past conflict behavior (since there is no past behavior by definition). Any theory that can account for the first dispute in a series should, a priori, be considered a cause of subsequent disputes. This observation suggests that the appearance of a dispute's linkages to earlier disputes is somewhat spurious. It is not so much repeated disputes that lead to increasing conflict, but the lack of resolution of the underlying grievance, or at least the persistence of other reasons for conflict other than previous outcomes.

The main methodological critique of the enduring rivalry program is that there is omitted variable bias.[1] The observation that a few dyads have a disproportionate share of the total number of crises could be explained by contiguity or some criterion other than dispute interdependence over time. Gartzke and Simon (1999) argue that it is not surprising that some dyads have fought many times. The presence of one crisis shows that the states have both the opportunity and the willingness to fight, while this is lacking in most dyads. Thus the presence of past crises does not increase the probability of conflict; instead it signals that there is a higher probability of conflict propensity in these states.

Further, Gartzke and Simon attempt to show empirically that these serial disputes could have been generated by chance. Statisticians refer to the phenomena of human pattern recognition in randomness as the "hot hand." The conventional metaphor comes from basketball, where it seems as if players "get hot" and will hit four or five shots in a row, and then "get cold," missing a few in a row. Yet statistical research has shown that the probability of making a shot is unaffected by the success of the last attempt (see Dixit and Nalebuff 1991). Gartzke and Simon remind us that probability theory suggests that we will see long strings of low-probability events occurring sometimes, even when events are independent. They hypothesize that enduring rivalries are "hot hands" rather than evidence of serially related disputes. While a few dyads have suffered through a disproportionate share of conflicts, it is possible that this observation could have been generated by a series of independent events. Using a Poisson model to calculate the probability of observing a certain number of confronta-

[1] Gartzke and Simon (1999) refer to the problem as the "instrumental variable problem," which is also correct since endogeneity problems can be reduced to omitted variable bias (King, Keohane, and Verba 1994).

tions between a dyad, Gartzke and Simon (1999) find that the observed frequency of crises between a few dyads could indeed be generated by a sequence of independent events.

Obviously, if dyadic disputes are independent, considerable doubt is cast on the claim by rivalry researchers that the links between disputes are important causes of war because they are related over time.[2] As Gartzke and Simon (1999, 784) observe, enduring rivalry research "depends on the claim that disputes in series are different from isolated disputes."

We believe that the Gartzke and Simon test should not be the final word on the validity of rivalry research or the serial crisis hypothesis. In the first place, their test was univariate. Only one parameter, the probability of a dispute, was estimated. Research on international relations has produced numerous theories on the variables influencing crisis propensities, including the effects of democracy, contiguity, major power status, and capability ratios. In statistical terms these unmeasured variables introduce unobserved heterogeneity to the estimation of the Poisson model. This biases standard errors downward and exaggerates statistical significance.[3]

Second, while Gartzke and Simon show that a model that assumes independence fits the observations reasonably well, they never compare the Poisson results to a model that assumes event interdependence such as the negative binomial. Thus, we are left wondering whether a model that takes dependence into account could better account for the crisis clustering.

Finally, we see no reason to assume that repeated conflict is due solely, primarily, or even marginally to the persistence of underlying causes or grievances. That is very much an empirical question. Even if there are core unresolved grievances, the psychological baggage associated with repeated confrontations might be expected to have an additive effect. Consequently, a more specific test of conflict propensities over time is necessary to invalidate the serial crises assumption. Only if we find that sequential confrontations are unrelated will we be in a position to say that there is no systematic interdependence among strings of conflict events. If we find that these conflict strings are related, we will still not know precisely how much causal credit or blame to allot to conflict recidivism, but we will have some better idea of whether it is warranted to

[2] Approaches that do not use disputes as coding rules for rivalry are less affected by this finding, as Gartzke and Simon (1999, 777 and fn. 1) themselves point out. Nonetheless, this is a nuance that not all readers are likely to keep in mind.

[3] Gartzke and Simon (1999, 797–98) realize the Poisson model that they use is dependent on the assumption that the expected number of conflicts per dyads is constant for each draw. Apart from the number of previous conflicts, there are a large number of possible influences (for instance, polarity or alliance ties) on the expected number of conflicts per dyad. Omitting these other influences introduces "unobserved heterogeneity" into the model which can result in biased estimates of the expected counts (Long 1997). For an attempt to statistically control for event dependence in a logit framework rather than counts, see Beck, Katz, and Tucker (1998). See also Crescenzi and Enterline (2001).

assume the probability of conflict interdependence. In the process of assessing this proposition, we can also check on some related possibilities.

Hypotheses

Building on past studies, we develop four hypotheses in this section relating past crisis behavior to present and future conflict propensities. While earlier work has focused alternatively on militarized disputes, crises, and wars, we limit our attention in this analysis solely to interstate crises. Further, we relate sequencing to different dependent variables, the risk of another crisis, and the risk of another violent crisis/war.

Sequencing

As stated above, there are two theoretical perspectives on sequencing in international crises. The first and probably most prevalent is that past crises make subsequent crises more likely within a dyad. Vasquez (2000) describes the repeated "probing" of adversaries through crises as a "step to war," whereby hardliners and those most likely to be mistrustful of an adversary gain the most influence in decision making (on this point, see Lebow 1981, 316; Lockhart 1978, 594). Vasquez (2000, 378) also states that, "the repetition of crises is the real engine of war. Adversarial images harden on both sides and stereotypes are formed that makes conflict resolution more difficult (see also Jervis 1976). Thus, past conflict makes another crisis more likely. It also increases the probability of that next crisis being violent. This leads to the two elementary serial crisis hypotheses.[4]

H1: The greater the number of past crises, the higher is the propensity for future crises.

H2: The greater the number of past crises, the higher is the propensity for future violent crises.

Contrary to the increasing conflict argument is McClelland's (1961) coordination argument, the war weariness hypotheses, and Lebow's (1981) and Rock's (1989) crisis catalyst thesis. All three arguments suggest that previous experience with crises, in some circumstances, could lead to a lesser likelihood of future crises. In the coordination case, less conflict occurs due to the reduction of uncertainty through repeated interaction, and through the higher salience of

[4] Brecher, James, and Wilkenfeld (2000, 43) include the argument that previous crises make subsequent crises more likely in their inventory of ICB propositions that have been tested and supported, but this issue remains relatively underdeveloped in their research program. Brecher and Wilkenfeld (1997) also devote some attention to protracted conflicts that sometimes overlap with dyadic rivalries but sometimes encompass multiple rivalries.

the costs of crisis to decision makers. Thus there will be fewer subsequent crises and/or fewer subsequent violent crises.

The war-weariness argument is that experience with a past traumatic event deters another occurrence in order to avoid additional pain and suffering. The problem here is that crises may or may not be sufficiently traumatic experiences to make decision-makers reluctant to re-engage. Similarly, the Rock argument cannot be applied generically. Some crises (for example, Fashoda) are said to be catalytic for reorienting rivalry relationships, but certainly not all or even most crises are likely to qualify. Still, these arguments do lend some support to the possibility of earlier conflict experiences leading to less, rather than more, conflict. With low expectations of systematic support on our part:

H3: The greater the number of past crises, the lower is the propensity for future crises.

H4: The greater the number of past crises, the lower is the propensity for future violent crises.

Research Design Considerations

To test the four hypotheses, we need to be able to distinguish among states that have had no crises, one crisis, and more than one crisis. For this purpose, we have created two sets of data. The first includes all dyads in the international system from 1918 to 1995 and information on their crisis behavior. This allows us to compare the likelihood of crisis occurrence between those states that have been involved in a past crisis and those that have not, while controlling for other factors.

To control for the Gartzke and Simon (1999) spuriousness possibility that previous crises merely demonstrate opportunity and willingness, our second set of analyses include only states that have been involved in at least one crisis in the years 1918 to 1995. By looking at the variation in conflict propensities within dyads that have been involved in past crises, we are able to control for many of the variables Gartzke and Simon suggest should be given causal priority. Moreover, we are also able to compare the probability of crisis recurrence after a first crisis, second crisis, and so on, in order to keep variation in our independent variable of interest.[5]

[5] Another approach to this problem would be to include an explicit selection component for the model (see Greene 1999). This would be an interesting future extension of the current project. We do not include this approach for two reasons. First, selection models have been developed for linear and logistic regression, neither of which we use in this project. Second, we report results for all dyads in the system in which selection is not as much of a problem. The confluence of results in both the general model and the smaller model should also increase the confidence in our findings and help answer the Gartzke and Simon critique.

Dependent Variables

We utilize the International Crisis Behavior Project data set (Brecher and Wilkenfeld 1997) to measure crisis occurrence and recurrence. The data include the presence or absence of crises between dyads in a particular year, as well as the escalation level of that crisis. This allows us to construct three dependent variables of interest. The first is whether or not any crisis occurred in a given year between a specific dyad.[6] The second and third are related to the type of crisis that occurred. We include separate variables, in addition to the mere presence or absence of a crisis, for those crises that involved violence and those that escalated to war in order to test the specific hypotheses above that relate the independent variable to the violence of the next crisis.[7]

Finally, some may object to our using ICB-coded crises rather than other events such as militarized interstate disputes or even scaled events data scores. We focus on crises primarily because Leng's (1983) findings on crises have long been cited as a sort of touchstone in this research area. We are fully prepared to accept Leng's generalizations about serial crisis behavior, including the three crisis-war stipulation. But we do not know whether these generalizations will survive the more comprehensive test we undertake in this analysis, even though Leng's earlier findings are precisely the sort of foundation needed to justify conflict interdependence and rivalry analyses.

We do not rule out the possibility that other indices of conflict may demonstrate interdependence over time. But there is also some possibility that other manifestations of conflict may be more amorphous in terms of whether actors learn from them as we think they do learn, or are capable of learning, from crises either through analogy (Khong 1992) or a lesson from history (Jervis 1976; Neustadt and May 1986). We accept Eckstein's (1975, 119) guidance that tests should first be conducted where evidence is likely to be found. If in these

[6] Brecher, James, and Wilkenfeld (2000, 3) define crises as situations in which decision makers perceive "a threat to one or more basic values, along with an awareness of finite time for response to the value threat, and a heightened probability of involvement in military hostilities." While we generally have few problems with this definition, our specific purposes require making some alterations. First, the ICB data set includes crises that take place within and outside of ongoing warfare. We prefer to delete all intra-war crises as distinctively different phenomena from prewar crises, a practice subscribed to by other non-ICB analysts (Diehl, Reifschneider, and Hensel 1996; Rousseau et al. 1996). Additionally, our hypotheses are dyadic in nature, whereas the ICB data set includes many multilateral crises. We code as crises only those cases in which the crisis actors view each other as the primary threat in that particular crisis. The nondirectional ICB participant coding encompasses actors that are on the same side, as well as actors that are less than fully involved. We need specific identifications of each crisis' main participants and whom they are confronting. If states are not learning about the adversary, or are not "counting" a certain crisis as part of its sequence with a given adversary, past lessons will not apply and we would not expect any relationship between crises. Another part of our approach is that we exclude "one-sided" crises as non-dyadic behavior (see Hewitt and Wilkenfeld 1999).

[7] The ICB project's violence range appears to encompass minor clashes as the minimal threshold to full-scale war.

crisis cases no support for the hypotheses is uncovered, then we can conclude that the notion of serial crisis behavior is a less concrete phenomenon than we had thought (see also King, Keohane, and Verba 1994, 209). On the other hand, if we included all militarized disputes as past conflict, or even all COPDAB or WEIS conflict events, and then found no support for the relationship between crises, it would be quite possible that it was our operationalization that accounted for our (lack of) findings rather than the specific empirical phenomena we most wish to test. To this end, we use the more restrictive crisis operationalization of past conflict to ensure that our empirical analysis conforms to the specific nature of the arguments being advanced.[8] This leaves us with 145 total crises between 1918 and 1995, 67 of which involved dyads that had engaged in one previous crisis in that period.

Independent Variables

Sequence

We code four dummy variables to account for the number of previous crises between a dyad. The first dummy is equal to 1 if there was only one previous crisis. The second is coded as 1 if there were two previous crises, and so on. Due to the small number of cases that entailed three or more past crises, the fourth dummy variable encompasses all such cases. For the first set of analyses, which includes all dyads in the international system, the comparison group is comprised of those states that have no previous crises. For the second set of regressions, which include only those states that have had at least one past crisis, the comparison group is comprised of those states that have had only one previous crisis. These reference groups allow us to test the serial crisis hypothesis that different sequences have different conflict propensities. We do not include a single count of the previous sequences, because we wish to test for specific nonlinearities and relate our findings to Leng's previous work, which calls for a jump in war-propensity after the third crisis. A count of previous crisis would not pick this up.

It must be acknowledged that our sequencing is incomplete. We include only information on crises between 1918 and 1995, and it is probable that some states had crises prior to this start time. Yet, this problem only raises the bar for finding a statistically significant difference between first, second, and third crises. Consider the hypothetical case that the first hypothesis is true and past crises make subsequent crises more likely. In this case, if we treat some crises as first crises when they are actually third crises, we are biasing the average propensity of first crises upwards (since we are including a volatile third crisis with a not so volatile first crisis). The practical result of this enterprise is that we are less likely to find significant differences. The same holds true if we

[8] It is indeed warranted for future research to test sequencing with MIDs as well.

suppose that the third hypothesis is true and past conflict makes subsequent conflict less likely.[9]

Control Variables

Gartzke and Simon (1999) point out that other factors can account for crisis propensity that are not related to past outcomes. Given the impossibility of random selection for this research design, we statistically control for democracy, alliance ties, contiguity, and major power status to reduce the chances of spurious correlation.

It is widely cited that the presence of democracy in a dyad reduces the chances for conflict (among others, Chan 1997). Thus, the presence of recurring conflict could be attributed to regime type rather than a sequence of past disputes. That is, autocratic actors might be more likely to engage in crisis recidivism than their democratic counterparts. On the opposite end of the spectrum, a contiguous dyad and a dyad that consists of major powers are more likely to fight than dyads that lack these characteristics (Bremer 1992, 2000). Additionally, realists stress the role of capability ratios within a dyad and the related concerns over security that will guide crisis propensities. While there is disagreement about the sign of the relationship, whether a balance of capabilities leads to peace or war, its importance is widely cited (see, for instance, Brecher and Wilkenfeld 1997; Geller 2000; Kugler and Lemke 1996).

Finally, as in the case of capability ratios, alliance ties within a dyad have elicited conflicting predictions. Conventional wisdom (Brzezinski and Huntington 1963) and a number of empirical analyses (among others, Maoz 2000) suggest that an alliance between states makes war less likely. Yet Bueno de Mesquita (1981) derives and finds support for the proposition that allies are more likely to fight each other, all things equal. Here we take no position on these specific debates but only include these variables to statistically control for factors that analysts typically consider to be alternative and causally prior explanatory variables.[10] Table 1 includes a description of these control variables.[11]

Methods

We estimate a Cox proportional hazard model to statistically analyze the relationships among these variables. The dependent variable in this model is the

[9] Allison (1995) notes that one way to check if the incomplete sequencing and left censoring are a problem is to delete the problematic cases and see if the results change. In this case, deleting the incomplete cases does not change any of the substantive findings.

[10] We use the EUGene software (Bennett and Stam 2000) to generate data for all dyads for the years 1918 to 1995 to code the control variables.

[11] Different operationalizations of democracy, for instance, including only the low score for the dyad, and, for alliances, coding only defense pacts, did not alter the results substantively.

TABLE 1

Descriptive Statistics for Control Variables

Variable	Mean	Std. Dev.	Min	Max	Description
Contiguity	0.04	0.20	0.00	1.00	1 if Dyad is Contiguous by land, 0 if not (COW contiguity data).
Major Powers	0.00	0.05	0.00	1.00	1 if both states are COW Major Powers, 0 if not.
Democracy	0.59	0.49	0.00	1.00	1 if at least one state is democratic, 0 if not.
Capability Ratio	−6.65	5.30	−38.15	0.00	Equal to the log of the lower capability divided by the higher capability in the dyad.
Alliance	0.09	0.29	0.00	1.00	1 if dyad is allied, 0 if not.

N = 448603

Note: Democracy score is based on subtracting the autocracy scale score from the democracy scale score. If at least one state has a score of 6 or above, the dyad is coded as including a democracy. Data generated using the EUGene program V. 1.95 (Bennett and Stam 2000).

hazard rate, or risk of a crisis. Intuitively, we are attempting to model the duration of peace between crises. Variables that speed up a crisis increase the hazard rate and decrease the duration of peace, while variables that slow down the risk of another crisis, decrease the hazard rate and increase the duration of peace. Interpretation of the model is similar to odds ratios from a logit specification. Yet the Cox method has two major advantages over either linear or logistic regression. First, hazard models allow what are called right-censored observations to convey information. A right-censored observation in this study would be a dyad that has not had another crisis by 1995 (the end of the study window). Linear regression would treat this systematically imposed censoring as an end point. Hazard analysis allows for the censoring point to contribute the fact that the observation lasted up to this point.

Additionally, unlike parametric hazard analysis and logistic regression, the Cox model does not assume a baseline hazard function.[12] The baseline hazard function is the pure time component in the model, similar to autoregression in linear regression. This is important because an incorrect baseline hazard specification can bias estimates (Allison 1995). The baseline hazard is factored with the constant in the Cox model and the partial likelihood taken to estimate the relationship between the independent and dependent variables. Lastly, we esti-

[12] Logistic regression is a special case of the exponential hazard model (see Beck, Katz, and Tucker 1998 and Allison 1995).

TABLE 2

Results from Cox Regressions for All Dyads, No Previous Crisis is Comparison Group

	Any Crisis			Violent Crisis			War		
Variables	Haz. Rat.	S.E.	*p*-value	Haz. Rat.	S.E.	*p*-value	Haz. Rat.	S.E.	*p*-value
One Prev. Crisis	5.27	1.74	<.01	3.51	1.46	<.01	4.30	2.90	<.05
Two Prev. Crises	8.83	3.20	<.01	8.75	3.20	<.01	17.24	10.43	<.01
Three or more Prev. Crises	10.00	5.65	<.01	8.86	6.44	<.01	19.97	19.16	<.01
Democracy	0.64	0.16	<.10	0.52	0.15	<.05	0.41	0.21	<.10
Major Power Dyad	6.11	3.00	<.01	6.52	3.87	<.01	1.96	2.52	N/S
Capability Ratio	1.02	0.03	N/S	1.01	0.04	N/S	1.12	0.05	<.05
Alliance	1.23	0.34	N/S	1.19	0.36	N/S	0.67	0.37	N/S
Contiguity	36.78	12.80	<.01	41.64	15.41	<.01	35.87	21.26	<.01
N-size	448063			448063			448063		
Number of Failures	146			96			27		
Log Likelihood	−967.83			−636.15			−171.62		
Wald Chi-Square (df = 8)	979.63 $p < .01$			805.64 $p < .01$			184.77 $p < .01$		

mate robust standard errors to account for the non-independence of observations between dyads.[13]

Findings

All Dyads

Table 2 reports the results of the first Cox regression. This analysis includes all dyads in the international system. The results show that the risk of a future crisis increases by a factor of 5.3 after the first crisis, as compared to the risk of crisis when there had been no crisis within the dyad and holding other variables constant. The risk increases slightly after the second crisis and the third crisis as well. In the third crisis and after, the risk of a subsequent crisis increases by a factor of 10, in comparison to dyads with no previous crises. Each

[13] Past research on crisis recidivism has used an arbitrary cut-off date to define recurrence. For instance, Diehl, Reifschneider, and Hensel (1996) only include observations 10 years after a crisis. Instead of using an arbitrary cut-off point, we include observations until the study as a whole is censored in 1995. This allows us to differentiate between a dyad that is involved in a crisis 11 years after its last crisis and one that is involved in a crisis 60 years after the previous crisis. Empirically, Hensel (1994) notes that disputes between Peru and Chile over the Tacna and Arica areas went 55 years between confrontations, while Argentina and Uruguay had a dispute gap over 61 years long. In both cases, the dyads were involved in another dispute over the same issue. A coding rule that censors observations after a certain deadline would miss these new outbreaks.

of these estimates is significant at the 0.01 level (for two-tailed tests), and the signs support the serial crisis hypothesis that the propensity for future conflict increases with the number of past crises. Further, the null hypothesis that all three coefficients are equal to zero (where the hazard rate would not differ based on sequence), can be rejected ($p < .01$ for a two-tailed test). The difference between the risk of a first and second crisis is significant at the .10 level (for a one-tailed test), suggesting that there is a significant increase in crisis propensity.

Other significant predictors of crisis occurrence are democracy, major power dyads, and contiguity. Democracy decreased the risk of crisis by a factor of 1.54, holding other variables constant. Major power and contiguous dyads significantly increased the risk of crisis. Most dramatically, being contiguous increases the risk of a crisis by a factor of 36.8, holding all other variables constant.

When we turn to the outbreak of violent crises and war, the positive relationship between past crises and conflagrations continues. The three sequencing variables are significant at the .01 level (for a two-tailed test). The risk of a violent crisis increases by a factor of 3.51 after the first crisis and a factor of 8.75 after the second crisis, in comparison to a dyad with no previous crises. Similarly, the risk of war increases by a factor of 4.3 after the first crisis and 17.8 after the second crisis, holding all other variables constant. While there is not a statistically significant jump after the third crisis, the risk of a future violent crisis and war does significantly increase after the second crisis ($p < .01$ for a one-tailed test). Likewise, we can reject the null hypothesis that sequences do not affect crisis behavior (that all three coefficients are equal to zero) at the .01 level for a one-tailed test.

Crisis Recurrence

Table 3 reports the results of the second set of Cox regressions that include only those dyads that had been involved in at least one crisis between 1918 and 1995. This test allows for us to isolate those dyads that have previously shown the opportunity and willingness to fight in the past.

The results strongly support the proposition that the probability of conflict is dependent on the number of past crises within a dyad. When we analyze the probability of any crisis recurring, the risk of recurrence increases by a factor of 16.1 after the second crisis, as compared to after the first crisis. Moreover, after the fourth or later crisis, the risk of recurrence is 79.9 times greater than after the first crisis. All three of the coefficients are significant at the .01 level (for a two-tailed test), and we can reject the hypothesis that sequences do not affect the risk of crisis recurrence (Wald Chi-square = 36.5.7, df = 3, $p < .01$).

While the coefficients support the serial crisis story that the probability of crisis recurrence increases as the number of past crises increases, there are nonlinear trends that need further research. To be more specific about the ups and downs of fluctuations in dyads over time and successive probabilities of

TABLE 3

Results from Cox Regressions for Dyads with at Least One Previous Crisis, One Previous Crisis is Comparison Group

	Any Crisis			Violent Crisis			War		
Variables	Haz. Rat.	S.E.	*p*-value	Haz. Rat.	S.E.	*p*-value	Haz. Rat.	S.E.	*p*-value
Two Prev. Crisis	16.15	9.76	<.01	13.21	8.12	<.01	3.73	2.30	<.05
Three Prev. Crises	17.64	12.52	<.01	15.75	12.72	<.01	9.43	7.31	<.01
Four or more Prev. Crises	79.93	61.57	<.01	52.42	41.85	<.01	29.99	20.74	<.01
Democracy	0.32	0.17	<.05	0.26	0.16	<.05	0.18	0.16	<.05
Major Power Dyad	4.38	2.21	<.01	3.16	1.41	<.01	1.56	0.93	N/S
Capability Ratio	0.90	0.04	<.05	0.92	0.04	<.10	1.20	0.13	N/S
Alliance	0.62	0.18	N/S	0.61	0.20	N/S	0.32	0.23	N/S
Contiguity	1.39	0.70	N/S	0.97	0.66	N/S	—	—	—
N-size	3005			3005			3005		
Number of Failures	67			51			16		
Log Likelihood	−245.75			−192.81			−58.12		
Wald Chi-Square (df)	151.83 (8)			128.24 (8)			58.06 (7)		

greater and lesser conflict, we would need to move to a much different type of analysis that entails more comprehensive information on dyadic relations than their occasional crises. In other words, future studies using case-specific, serial examinations of dyadic events data would augment our current project.

When we look at the probability of crisis recurrence, violence, and war, the hazard ratios again highlight the importance of sequences. Sequences not only make crises more likely, they make violent crises more likely. The risk of a crisis reoccurring violently is 52.4 times greater after the fourth crisis than it is after the first crisis between adversaries, holding all other variables constant, and the risk of war is 30 times greater. While the risks rise incrementally from crisis to crisis, the risk of violence and war is significantly greater after the fourth crisis, as compared to after the second crisis ($p < .01$ for a one-tailed test).

As for the control variables, conventional wisdom is supported in most cases. Dyads including at least one democracy are 3.1 times less likely to suffer a future crisis, 3.8 times less likely to be involved in a subsequent violent crisis, and 5.5 times less likely to be involved in a future war, holding other variables constant.[14] Conversely, a major power dyad is 4.1 times as likely to come into crisis again, as compared to other types of dyads. While contiguity is insignificant when predicting the outbreak or crisis or violence, all 16 wars included

[14] This finding appears to support the idea that the democratic peace applies at the monadic level as well as at the dyadic level. For arguments about revising the former consensus that the democratic peace is strictly a dyadic phenomena, see Russett and Starr (2000) and Ray (2000).

TABLE 4

Dyads Involved in Multiple Crisis Sequences

4-7 Crisis Sequence	3 Crisis Sequence	2 Crisis Sequence
**India-Pakistan (7)*	**Afghanistan-Pakistan*	**Angola-Zaire*
**US-USSR*	**Algeria-Morocco*	**Argentina-Chile*
**Egypt-Israel (6)*	**China-Vietnam*	**Bolivia-Paraguay*
**Israel-Syria (5)*	**Ethiopia-Somalia*	**Cameroon-Nigeria*
**Greece-Turkey*	*France-Libya*	**Chad-Libya*
**Ecuador-Peru (4)*	**Honduras-Nicaragua*	**China-India*
	**Iraq-Iran*	**China-Japan*
	**Japan-Russia*	**China-US*
	North Korea-US	**Egypt-Libya*
	**Tanzania-Uganda*	**France-Germany*
		France-Ottoman E.
		**Hungary-Yugoslavia*
		Iceland-UK
		**Indonesia-Netherlands*
		Iraq-US
		**Israel-Jordan*
		**Italy-Yugoslavia*
		Laos-Thailand
		Libya-US
		**Lithuania-Poland*
		Ottoman E.-UK
		Panama-US
		**Poland-Russia*

*Indicates the dyad is considered a strategic rivalry.

contiguous states. Thus, for estimation purposes, contiguity could not be included in the model predicting war. We also find that the closer the capabilities of the adversaries, the lower the risk of a future conflict (short of war). While this finding may seem counterintuitive to those who view parity as more dangerous than asymmetry, the reason for this outcome may have more to do with the foundations for continuing rivalry than it does capability per se.

If one looks at the identities of crisis recidivists, the number of asymmetrical pairs are difficult to miss. Table 4 lists dyads with two or more crises. Relationships described as strategic rivalries (Thompson 2001), which involve competitive states that view each other as threatening enemies, are identified with an asterisk.[15] We see at least two processes at work. One involves non-rivalries in

[15] Strategic rivalries are not based on dispute densities but instead are measured in terms of decision-maker perceptions about who their foreign enemies were in any given year, based primarily on an extensive mining of diplomatic histories and country study materials. Note that all enemies are not also considered competitors (as, for instance, in the case of Norway and the Soviet Union during the Cold War). Strategic rivalries must satisfy perceptual requirements pertaining to statuses as competitors, threats, and enemies.

which major powers have engaged in some asymmetrical conflicts repeatedly (for instance, China-Vietnam, France-Libya, North Korea-U.S.). In such cases, the stronger power either has been less than able to project its full strength, has been constrained from a full-scale clash, or both generalizations apply. While strategic rivalries tend to match states with roughly equal power (i.e., as competitors), that is not always the case, as the Indo-Pakistani case most vividly illustrates. Here again, there are various constraints operating on the stronger of the two rival powers to prevent some sort of terminal solution to the tendency to clash repeatedly. Thus, the point is not that a dyadic balance of power makes crisis recurrence less likely, but that other factors do not preclude asymmetrical dyads from engaging in multiple crises in greater frequency than one might anticipate.

Table 5 exposes more dramatically some of the relationships between rivalry and crisis recurrence. As one moves more deeply into the crisis recurrence chain, the role of rivalry becomes increasingly more evident. The majority of interstate dyads with only one crisis (60%) represent nonrivalry situations. But states

TABLE 5

Rivalry-Nonrivalry Crisis Sequence Comparisons

	Rivalry		Nonrivalry	
Crisis Dyads	Number	%	Number	%
1 crisis	24	40.0	36	60.0
2 crises	15	65.2	8	34.8
3 crises	8	80.8	2	19.2
4 or more crises	6	100.0	0	0.0
Serious Clashes and War				
1 crisis	15	57.6	13	38.2
2 crises	13	43.3	5	31.3
3 crises	17	70.8	1	16.7
4 or more crises	15	44.1	0	0.0
Escalation in Next Crisis				
Yes	25	42.4	4	33.3
No	34	57.6	8	66.7
Full-Scale ICB Wars				
1 crisis	6	85.7	1	14.3
2 crises	3	60.0	2	40.0
3 crises	4	100.0	0	0.0
4 or more crises	9	100.0	0	0.0

Note: Crisis dyad and war information are proportionalized across the columns. Percentages are calculated within the rivalry and nonrivalry categories for the clash/war and escalation questions.

with more than one crisis tend to involve strategic rivalries. Rivalries claim 65% of the two crisis cases, 80% of the three crisis, and 100% of the cases with more than three crises. However, the different behaviors manifested by rivalries and nonrivalries do not translate into a straightforwardly linear progression of a greater risk of serious clashes. Differentiating between cases involving no violence/minor clashes and those leading to serious clashes/full-scale war, nonrivalries become generally less dangerous as they engage in multiple crises. Crises within rivalries are most likely to be more serious in the first onset or the third. The rivalries with the most crises (more than three) tend to mix serious and not-so-serious confrontations almost equally—at least that is the outcome if we simply aggregate crisis violence outcomes without reference to sequence. If we bring sequence back into the picture, a rivalry crisis is more likely to be followed by another crisis involving greater violence than are nonrivalry crises, but not by a great margin (42% versus 33%). On the other hand, rivalries involve many more instances of crisis recurrence than nonrivalries (59% versus 12%), so that rivalries are most likely to be associated with the most deadly outcomes. Of the 25 full-scale war outcomes associated with the ICB crises on which we are focusing, all but three, or 12%, were between rivals.

Finally, a word about Leng's (1983) three crises and war rule is in order. Most of our findings corroborate Leng's early emphasis on crisis sequences and their interdependence. One generalization that is not corroborated is the three-crisis rule. Of the sixteen crisis sequences with three or more confrontations, two (India-Pakistan and Egypt-Israel) went to war before they had experienced their third crisis. Eight sequences did not experience a full-scale war by ICB standards after three crises.[16] Five did, and one other case (Israel-Syria) went to war in its fourth crisis. Without doubt, multiple crises increase the probability of conflict, but the number three does not appear to be as critical as Leng's more limited data had suggested.

Conclusion

In sum, the analyses strongly support the serial crises argument. Previous crises make subsequent crises more likely. We are now in a position to at least begin to answer Gartzke and Simon's critique of the serial crisis assumption. Serial crises are different from isolated disputes due to their propensity to recur quickly and to recur with violence. They are not statistical anomalies; rather they reflect longitudinal processes of persistent mistrust and hostility and, of-

[16] The threshold used in the ICB approach to identifying full-scale wars is not always clear. For instance, there is no war outcome between China and Vietnam associated with three crises in the 1980s, but there is a war outcome in the Greek-Turkish 1974 case. In the latter case, the ICB may have the Cypriot-Turkish war in mind when coding the outcome for the crisis case. Some of this awkwardness may be due to our transformations of the crisis cases into dyadic encounters between the main participants.

ten, rivalry. But if they were only that—reflections of underlying threat and disagreement—we should expect all rivalries to exhibit similar expressions of conflict. They clearly do not. A very small number of rivalries have experienced a string of crises (and wars). A larger number have experienced one or two crises. But a good number have experienced none at all.[17] Then, too, crisis sequences are not monopolized by rivalries, even though crisis recurrence is much more likely within rivalry.

Still, the effects of crisis sequences do not disappear when we control for rivalry relationships or, for that matter, when we control for contiguity, capability ratios, regime type, or alliances. Crises, therefore, are hardly independent events. Their interdependence over time needs to be highlighted and studied more closely. Consequently, the study of rivalry is amply justified. Exactly how rivalry dynamics work, however, remains to be delineated. In this sense, we do not yet have a fully developed theoretical answer to Simon and Gartzke's challenge. But we can be more confident that crisis recurrence linkages are part of the answer—and that we no longer need to assume that crises tend to be interdependent across time.

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[17] Between 1918 and 1995, 143 strategic rivalries were in existence. Of them, 43 experienced ICB-reciprocated crises, whereas 100 rival dyads experienced no crises.

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Michael P. Colaresi is a Ph.D. candidate in political science, Indiana University, Bloomington, IN 47405-7110.

William R. Thompson is professor of political science, Indiana University, Bloomington, IN 47405-7110.