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Reflections on the Scientific Study of War

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The chapters in this volume demonstrate what has become increasingly clear to most of those engaged in the systematic study of international conflict: we have made significant progress in the analysis of the causes of war and the conditions of peace over the last two decades, as a result of improved theoretical frameworks, research designs, and statistical techniques. At the same time, there have been important changes in the empirical world that we want to explain, and these changes have also affected the study of war and peace.

My aim in this brief chapter is to identify some of the more notable developments in the scientific study of war. I emphasize the movement away from a preoccupation with the great powers, the shift from the systemic level to more emphasis on dyadic-level interactions and on societal-level explanatory variables, and the increasing complexity of our theories of international conflict.¹

One trend concerns the empirical domain of our investigations. As a field, we have shifted from a long-standing concentration on the great powers to more attention to conflicts among and within smaller states in the world system. This shift is the result of the end of the Cold War and of the bipolar rivalry that dominated much strategic thinking during the last four decades, the collapse of the Soviet Union and the Soviet empire, and the proliferation of interstate wars between smaller states in the system and especially civil wars within them (Holsti 1996).

Many of these conflicts are ethnonational conflicts or "identity wars" that are fought between communal groups rather than between states and that often cut across state boundaries. Although for years the analysis of ethnonational conflicts tended to be descriptive and idiographic, in the last few years scholars working in this area have become more systematic and rigorous in terms of data analysis and formalization (Gurr 1993; Licklider 1995; Holsti 1996; Carment and James 1997; Fearon and Laitin 1996). This change has been facilitated by the develop-

ment of new databases that include communal groups and other nonterritorial actors as well as states (Wallensteen and Solenberg 1998; Marshall 1999; Wayman, Sarkees, and Singer 1997), in recognition that conventional conceptualizations of warfare need to be modified.

Another significant trend has been the shift away from the systemic level in the analysis of war. This takes two forms. One is a greater interest in explaining dyadic-level behavior as opposed to systemic-level patterns.² The other is a greater interest in societal-level variables in the explanation of state foreign policies and dyadic-level interactions.

A number of reasons explain this growing interest in dyadic-level behavior. Scholars have come to realize that some of the key causal arguments that had previously been associated with conventional systemic-level models are better specified at the dyadic level. Many of the causal arguments invoked in support of both the power parity hypothesis and the power preponderance hypothesis, for example, are essentially dyadic in nature, though these hypotheses are often confounded with systemic-level balance of power and power transition theories (Levy 1989b: 232). Similarly, although hypotheses on the relationship between economic interdependence and war are sometimes formulated at the systemic level (Mansfield 1994), many of the theoretical arguments that are advanced in support of these hypotheses refer to commercial or financial interdependence between two particular adversaries and the presumed negative impact of war on the benefits from economic interdependence. Thus, many hypotheses on economic interdependence and war are better specified at the dyadic level (Barbieri 1996a; Oneal and Russett 1997), and we should recognize that dyadic-level causal linkages cannot be automatically applied to the systemic level.

Another consideration behind the shift to the dyadic level is the increasing influence of bargaining models in the international relations field as a whole, for these analytical frameworks emphasize the fact that war is inherently a dyadic phenomenon (Morgan 1994; Fearon 1995; Leng, chap. 11 of this volume). In addition, the Cold War and the Soviet-American rivalry that defined it helped generate questions about the origins, evolution, and termination of enduring rivalries in international politics (Diehl 1998; Thompson 1999; Goertz and Diehl, chap. 9 of this volume; Wayman, chap. 10 in this volume).

Interest in dyadic-level behavior derives also from the fact that systematic empirical research has generated much stronger findings at the dyadic level than at the monadic or systemic level. The democratic peace is the most obvious example. Whatever the relationship between democracy and peace at the monadic or systemic level, it cannot match the nearly law-like relationship at the dyadic level (Russett 1993; Ray 1995; Ray, chap. 14 in this volume). Another illustration is the dyadic relationship between territory and war, which is also quite strong (Vasquez 1993; Diehl 1998; Huth 1996b, chap. 5 in this volume).³ Finally, while debate goes on about the form of the relationship between the distribution of military capabilities and war at the systemic level, there is a growing consensus that

at the dyadic level an equality of capabilities is significantly more likely to lead to war than is a preponderance of power (Kugler and Lemke 1996).

It would be premature to abandon the systemic level entirely, however, because the weak findings of some systemic theories may derive from the fact that those theories have not been properly specified. In particular, scholars tend to posit a single international system and neglect the role of regional subsystems that operate within the international system and that interact with it (and with each other) in important but relatively unexplored ways. The failure to distinguish between the global system and the European subsystem is particularly serious (Levy 1998:148–49). When Rasler and Thompson (1994) analyze trends in the distribution of capabilities at each of these levels, for example, they find that an increasing concentration of military power at the regional level often contributes to large-scale regional wars, but these regional wars escalate to global wars only under conditions of a deconcentration of naval power and economic wealth at the global level.

Similarly, it would be useful to explore interaction effects between dyadic relationships and the systemic context within which they occur. Geller (1993, chap. 12 in this volume) finds that dyadic power transitions are correlated with war under conditions of decreasing systemic concentration but not under conditions of increasing systemic concentration, where no dyadic transition war has occurred. These are powerful results, and they suggest that the investigation of the interactive dynamics of global and regional systems is an important question for further research.

There has also been a significant shift to societal-level explanatory variables, including regime type (democratic or authoritarian), the political security of governing elites, public opinion, and other characteristics of society. Before the late 1980s, scholars studying international conflict devoted less attention to the societal level than to any other level of analysis, but that situation has completely reversed itself, as some of the most exciting new work in the field is now being conducted at the societal level. We can trace this shift to growing frustration with the inability of structural systemic models to explain enough of the variance in war and peace (either in the system as a whole or in dyadic relationships between states); to the decline of systemic imperatives arising from the bipolar Cold War structure; to the increasing salience of smaller, politically unstable states and ethnonational movements in the post-Cold War world; to the impressive explanatory power of democratic regime type and particularly of joint democracy; to the availability of good quantitative data on key societal variables (Gurr 1989); and to recent developments in the discipline that emphasize the impact of domestic political institutions on policy choices and outcomes.

Another distinct trend that has emerged in the literature is an increasing recognition of the complexity of the question of the causes of war and various attempts to model various aspects of that complexity. To begin with, guided by the levels-of-analysis framework (Waltz 1959; Singer 1962), scholars have devoted a dis-

proportionate amount of time over the last three decades to the question of which level of analysis provides the most powerful explanations of the causes of war and of international behavior more generally.⁴ The debate has shifted, however, and we now find more and more efforts to integrate variables from different levels of analysis into a single model. Many statistical models of international conflict now include domestic as well as structural-systemic variables. Game-theoretic models, which a decade ago were applied almost exclusively to problems of strategic interaction between states, now incorporate domestic structures and processes as well.

Despite this shift toward multilevel theories, most of the models in the quantitative-empirical literature (whether they consist of explanatory variables from a single level or several levels) have been additive in nature and do not incorporate true interaction effects.⁵ This is gradually beginning to change, however, and scholars are slowly beginning to incorporate interactive effects into their models. This is either done directly by including an interaction term in the model or indirectly by estimating a model separately for different values of a third variable. It is increasingly common, for example, for researchers to conduct separate analyses of war for contiguous and noncontiguous states, to incorporate the interaction effects between contiguity and alliances (Siverson and Starr 1991), trade (Oneal and Russett 1997), and a variety of other variables. These models are still in the minority, however, and simpler additive relationships are still the norm. In the conclusion I return to the importance of building interaction effects into our models of war.

Applications of game-theoretic models have also become more sophisticated and more complex.⁶ Prisoner's Dilemma and related 2×2 games were useful for the analysis of simple strategic situations (Rapoport and Guyer 1966; Snyder and Diesing 1977), but the move to extensive form games, particularly those involving incomplete information, marked a significant theoretical advance. These games better reflect empirical reality because they model conflict as a sequence of choices by actors that typically lack complete information about the preferences and intentions of their adversaries. This significantly expands the range of theoretical questions open to investigation.

The treatment of war in terms of a sequence of choices, which has long been common in the qualitative literature on decision making, represents an increasingly dynamic conceptualization of war that is also reflected in much of the recent quantitative empirical literature. Early studies in the correlates-of-war tradition looked for simple empirical associations between systemic structures and the frequency and severity of war, reflecting rather static balance of power propositions.⁷ This research tradition has evolved in a way that now conceptualizes international conflict as a process or series of steps (Vasquez 1993) that lead from background conditions to the occurrence and evolution of militarized disputes to the outbreak and evolution of international war, and war in turn affects background conditions (Bremer 1995b).

The increasing complexity of theories of war and peace is also manifested in the greater attention to the possibility of reciprocal causation and other forms of "endogeneity," in which the values of the explanatory variables are determined, at least in part, by the dependent variable (King, Keohane, and Verba 1994). Scholars have increasingly come to recognize that previous attempts to model actors' responses to exogenous events, institutions, and other external shocks neglected the possibility that those events or institutions were themselves the endogenous result of conscious strategic behavior.⁸ That is, the causal arrow leading from the independent explanatory variable to the dependent variable may be reversed.

Studies of the democratic peace, for example, look not only at the impact of democracy (or joint democracy) on war and peace but also at the extent to which peace creates the conditions under which democracy is able to flourish (Thompson 1996). Similarly, while scholars have investigated the liberal hypothesis that trade promotes peace (Oneal and Russett 1997), it is also clear that peace often creates the conditions favorable to trade, and it will ultimately be necessary to incorporate both of these effects into a single model (Reuveny and Kang 1996).⁹

There are numerous other examples of endogeneity problems and attempts to deal with them. Although many empirical studies of deterrence conclude that the impact of military power differentials on crisis bargaining outcomes is somewhat limited, these studies, which use the existence of a prior threat as a criterion for case selection,¹⁰ ignore the fact that such power considerations may have determined whether an actor chose to make the initial threat to begin with. The finding by Huth and Russett (1984) that extended deterrence is significantly more likely to fail if the protégé has a preexisting alliance with a major power defender is explained by the fact that the aggressor will only initiate the prior threat if it is highly motivated and willing to defy the anticipated deterrence threat by the protégé's great power defender (Levy 1989a: 117–20). If the challenger is weak, it will not make the initial threat, and this "nonevent" will not appear in the sample of cases to be analyzed. Thus, examining cases in which an initial threat has been made involves a biased sample of cases. This "selection effect" is generated by the fact that the occurrence or nonoccurrence of the initial threat is endogenous to the balance of power and interests.

Although some earlier studies identified endogeneity problems and their related selection effects in particular studies, they failed to provide ways of dealing with the problem. More recently, rational choice models have sensitized researchers to endogeneity problems¹¹ and have begun to model the strategic dynamics involved, and in the process they have generated important and sometimes counterintuitive predictions. Fearon's (1994) signaling game model of immediate deterrence, for example, shows that *ex ante* measures of the balance of interests based on alliance ties or geographic contiguity between a target and its defender are associated with the failure of immediate deterrent threats, because the challenger has already incorporated these considerations into its calculations.¹²

Similarly, one explanation for the common finding that states frequently do not honor their alliance commitments after their ally is attacked focuses on the conditions under which military attacks occur in the first place. A challenger is more likely to attack when it expects that the target's ally is unlikely to intervene than when it expects intervention. If we look at the relative frequency with which allies come to the aid of their friends, we would fail to count those cases in which attacks do not occur because of the challenger's anticipation of intervention, and this would lead to a biased sample and erroneous causal inferences (Smith 1995).

Another significant shift in the study of war is toward the construction of multi-method research designs, either in a single study or in a broader research program. Two decades ago there were relatively few studies that combined decision or game-theoretic models with statistical tests, but this is the norm today.¹³ We also find many examples of scholars combining case studies with statistical analyses (Huth 1988).

Though many regard game theory and case studies as noncomplementary methods, this significantly underestimates their respective synergistic effects. Case studies can be a useful means of illustrating the dynamics specified in game-theoretic models (Bueno de Mesquita and Lalman 1992: chap. 7; Brams 1994) and of suggesting how those models might be refined. They can also be used to assess the preferences that are treated exogenously in many models. Finally, game-theoretic concepts can provide a useful guide for case study explanations of individual episodes. The research program on "analytic narratives" (Bates et al. 1998), for example, is a methodologically self-conscious effort by scholars in several fields to combine rational choice theory with case study methods. Both "hard" and "soft" rational choice models have been used in attempts to explain the causes of particular wars (Bueno de Mesquita and Lalman 1992: chap. 7; Levy 1990/91).

One example of the utility of a research program that combines large-*N* statistical studies, case studies and (increasingly) game-theoretic models by numerous scholars is the study of the interdemocratic peace. Quantitative studies have been indispensable in demonstrating the basic descriptive-level finding that democratic states rarely if ever fight each other. They have also been essential in determining that this finding cannot be traced entirely to the effects of wealth, geography, alliances, or other possible confounding variables and that the finding reflects something about joint democracy itself (Russett 1993; Ray 1995, chap. 14 in this volume).

Qualitative studies have been useful in exploring the hypothesized anomalies in the democratic peace proposition; in examining the extent to which decision makers perceived their adversaries as democracies (which is a testable implication of many theoretical formulations of the democratic peace); in attempting to assess whether the peaceful resolution of crises between democratic states in individual cases was due to the democratic character of their regimes or to other

factors; and in exploring in individual cases the plausibility of alternative explanations of the democratic peace phenomenon (Brown et al. 1996; Elman 1997).

Even those who accept the lawlike character of the democratic peace proposition, however, concede that we have no fully satisfactory theoretical explanation for it. Scholars have recently begun to construct game-theoretic models in an attempt to provide a more rigorous model of the complex strategic interactions of states with their adversaries and with their own domestic publics (Schultz 1998). Although we still lack a fully satisfactory theory of the democratic peace, many scholars will agree that the cumulative results of the aforementioned efforts have been far more convincing than those produced by any single method (Ray, chap. 14 in this volume).¹⁴

CONCLUSION

In my emphasis on scholars' growing recognition of the complexity of the social world and on their attempts to model it, I have noted the recent effort in the quantitative empirical literature to move from purely additive models to the incorporation of interaction effects. It is interesting to note that this trend has a parallel in the literature on the comparative method. Some have begun to emphasize the importance of "multiple conjunctural causality" (Ragin 1987), in which outcomes are the product of the intersection of several distinct conditions and in which the impact of one condition is contingent upon the presence of another condition.

Moreover, a given outcome can occur through several alternative causal paths,¹⁵ and variables important or even necessary in one sequence may have no impact in another (Levy 1989b: 296; Vasquez 1993; Braumoeller 1999). It is conceivable, for example, that an outcome may arise from several different causal sequences, each of which consists of a set of variables that is jointly sufficient for the outcome but not jointly necessary. Moreover, there may be an individually necessary condition nested within each set of jointly sufficient conditions, so war cannot occur through one particular causal path unless a particular condition is present. The presence of a particular factor may have little impact on war in the vast majority of circumstances but have a decisive effect when certain combinations of other variables push nations to the brink of war. As a result, the processes leading to war can be highly context-dependent and nonlinear (Beck, King, and Zeng 1999).

To the extent that this kind of complexity exists in the social world, it poses a challenge for those engaged in the systematic study of war. It is difficult for conventional statistical methods to deal with such interactive, context-dependent, and nonlinear relationships, given the assumptions of linearity and normality in those models. Moreover, the standard practice of adding variables to capture these interaction effects may not always be practical. The number of variables

needed to capture complex interaction effects quickly becomes large, consumes degrees of freedom, inflates standard errors, and makes it harder to achieve statistical significance. The loss of degrees of freedom is particularly critical because war is a relatively rare event.¹⁶

International relations scholars are just beginning to grapple with the problem of how to systematically analyze phenomena that arise from highly nonlinear, interactive, and contingent processes. Case study researchers tend to deal with these problems as they arise in individual cases, but they face the problem of how to generalize their findings to other cases and to validate those generalizations empirically. More quantitatively oriented scholars have recently begun to develop methods for dealing with such problems (Ragin 1987; Beck et al. 1999; Braumoeller 1999), and the further refinement of these methods is an important task for future researchers.

NOTES

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1. This study builds on Levy (1998).
2. For example, the distribution of power in the international system is a systemic-level variable, whereas the distribution of power between two particular states is a dyadic-level variable.
3. Bremer (1992) shows that the probability of war is thirty-five times higher for contiguous dyads than for noncontiguous dyads for the 1816–1965 period, and Vasquez (1996a) shows a strong tendency for wars involving contiguous states to be dyadic but for wars involving noncontiguous states to be multilateral.
4. That is, do the causes of war derive primarily from systemic-level power distributions, alliance patterns, or related variables; from national-level societal characteristics or governmental structures or processes; or from individual-level belief systems, personalities, or emotional states?
5. An additive relationship is represented by the sum of two or more variables, each of which can have an impact independently of the presence of other variables. Interaction effects are represented by the product of two or more variables, and the impact of each variable depends on the value of the other.
6. We should not forget that little more than a decade ago some of the most influential rational choice modeling in the international relations field was based on expected-utility models (Buono de Mesquita 1981). The shift to game-theoretic models (Buono de Mesquita and Lalman 1992) represented a major paradigm shift.
7. Early examples of more dynamic approaches to the study of international conflict include models of arms races (Richardson 1960), power transitions (Organski 1958; Kugler and Lemke 1986; see also DiCicco and Levy 1999), and lateral pressure (Choucri and North 1975). More recent work that emphasizes the dynamics of conflict processes at the systemic or dyadic levels includes theories of long cycles (Thompson 1988) and enduring rivalries (Diehl 1998; Thompson 1999; Goertz and Diehl, chap. 9 in this volume).

8. An “exogenous” variable is one that is taken as given and is not caused by other variables in the model. An “endogenous” variable is one that is explained by other variables in the model.

9. Realists and Marxists dissent from the view that trade promotes peace (Barbieri 1996), and some evidence indicates that trade sometimes continues between adversaries during wartime, contrary to common applications of both liberal and realist theories (Barbieri and Levy 1999).

10. If the defender issues a deterrent threat in response to this initial challenge, and if the challenger then fails to implement its threat, it is assumed that deterrence is successful. Without an initial threat, however, it would not be clear whether the absence of an attack was due to the success of deterrence or to the fact that the challenger had no intentions of attacking in the first place.

11. Research on “system effects” (Jervis 1997) has made a similar contribution.

12. *Ex ante* measures refer to information that existed before a crisis begins.

13. Scholars have recently questioned whether the assumptions of standard statistical models are technically compatible with the game-theoretic models they are used to test, and these scholars have been developing new methods that better capture the strategic dimensions of conflict behavior that are emphasized in game-theoretic models (Signorino 1999; Smith 1998).

14. Another research program in which scholars have combined quantitative, qualitative, and formal modeling methods in effective ways is the diversionary theory of war (Russett 1990; Morgan and Bickers 1992; Levy and Vakili 1992; Richards et al. 1993).

15. Systems theorists call this “equifinality.”

16. A “degrees of freedom” problem arises when a model has too few parameters relative to the number of data points.