THE POWER–CONFLICT STORY: A SYNOPSIS

Kelly M. Kadera
The University of Iowa

Abstract. The focus of this article is the development of a differential equations model that integrates balance of power and power transition theories. This integration is achieved by proposing three different conditions, each of which is associated with specialized conflict behavior. Extrapolation from the traditional theories' arguments about war to the forces governing the ebb and flow of conflict is another integration technique. Most notably, the formal model predicts three types of power transitions: deflections, tortoise and hare transitions, and single transitions. Only the single transition is similar to the type of transition predicted by power transition theory. The other two types are important because they account for unsuccessful challenges. Important differences in conflict patterns also distinguish the three transition types from one another. The model also makes predictions concerning the relationship between two rivals' conflict levels and the timing of conflict peaks.

Using a case study for each of the three types of transitions, the predictions are tested using MID data supplemented with historical analyses. Empirical support is strong. Substantive conclusions include recommendations for slowing rates of reaction, cautions concerning the dangers of the post-transition phase, and advice for tortoises to conserve their resources. This project also advocates the usefulness of a broader collection of events data than is currently available and the possible need for variables that trace the evolution of bonds that tie nations together.

In the late nineteenth century, Germany experienced unprecedented economic and military growth. By the early twentieth century, Germany had surpassed Britain as the dominant European power. This transition in power among the European nations led to WWI and WWII, two of the most extensive and bloody wars in modern history. Germany’s provocative strategy ultimately resulted in its total defeat; the nation was partitioned, not to be rejoined until 1990. During the Cold War, the United States and the Soviet Union shared approximate parity and joint dominance of the international system. Despite (or

*This article summarizes the dissertation, Power Growth and Decay and Conflict Behavior in Dyadic Rivalries: A Dynamic Model, which was submitted in partial fulfillment of the requirements for the degree of Doctor of Philosophy in Political Science in the Graduate College of the University of Illinois at Urbana-Champaign in 1995. Dina Zinnes (chair), Robert Muncaster, and Paul Diehl were committee members. It serves as the basis for a book titled The Power–Conflict Story: A Dynamic Model of Interstate Rivalry, forthcoming from The University of Michigan Press.
due to) their persistent rivalry and shared ability to inflict harm on one another, they never fought a large scale, direct military confrontation. In the early 1990s, the Soviet Union dissolved, and a weaker Russia took its place as a major player in the international arena. These two seemingly different stories, as well as many others, lead me to ask, what is the underlying relationship between dyadic power distributions and conflict behavior? That is the question this dissertation seeks to answer.

I begin by briefly presenting the traditional balance of power and power transition answers to this question and the empirical results of work that seeks to resolve the theoretical debate. Next, I address the techniques used to integrate the theories and the need for a dynamic model. Afterward, the formal model and its deductions are summarized. Finally, results of the empirical analysis and some important conclusions are highlighted.

TRADITIONAL ANSWERS

The relationship between power and conflict has long been central to the field of International Relations. Power, in the tradition of Realpolitik, is thought of as the currency of politics among nations; and international conflict is the normal outgrowth of power relations. Our understanding of the power-conflict relationship has been hindered by the failure to resolve a long-standing debate between two opposing schools of thought, balance of power theory and power transition theory. In their review of the distribution of power literature, Siverson and Sullivan state that the “two theories ... make completely opposite predictions about the effect of the equality of power in the international system” (1983:474). Scholars favoring the balance of power theory argue that approximate parity brings peace. Others, favoring the power transition theory, believe power parity is a war-prone condition.

Balance of Power Theory

In order to see how two theories could come to such fundamentally different conclusions, it is necessary to examine them more closely. Balance of power theorists (e.g., Kissinger, 1979, 1994; Liska, 1962; Waltz, 1979; Morgenthau, 1985) argue that an approximately equal distribution of power (or capabilities) across a system of nations tends to produce a peaceful equilibrium. Extension of this argument from a system of nations to a dyad has been achieved in the deterrence literature (see, for example, George and Smoke, 1974; Snyder, 1961).
Here, the view is that two approximately equal rivals will deter each other from initiating an attack, so war is unlikely. The dyadic focus is not at all unusual. Wayman and Singer, in a recent review of the vast and diverse research associated with the Correlates of War Project, note that "whereas the [initial] outlook led one to expect that the systemic level would be more important than the dyadic, it now appears that it might be the other way around" (1990:2).

Balance of power scholars reason that when the power distribution is roughly equal, each nation's capabilities serve as a check and balance against aggression by the opponent(s). Since neither nation has a clear advantage, both are uncertain about their chances of winning a war. Finding war too risky in this sense, both rivals choose not to initiate one. If the balancing mechanism breaks down, however, and one alliance or nation becomes preponderant, war is more likely than it was during equality. Thus, preventing an opponent from gaining an advantage is crucial to self-survival, because a preponderant nation will aggress against its competitor. One might liken this to the *para bellum* adage, "if you want peace, prepare for war."

According to this logic, war may occur in one of two ways. First, the theory postulates that the reason balance is essential for peace is that by nature, nations are aggressive and seek to maximize power. Nations with unchecked power are likely to exercise these aggressive tendencies, potentially by initiation of war with weaker nations. The logic of the balancing mechanisms certainly does not exclude, however, the possibility that war is initiated by the weaker state(s) in an effort to return the power distribution to equilibrium. If other balancing efforts fail to prevent domination or are insufficient, lower-ranked nations may possess no alternative to war. More generally, balance of power theorists view conflict behavior as both a manifestation of natural aggressive tendencies and as a mechanism for adjusting the power distribution.

In sum, the key propositions of the balance of power explanation are: 1) under relatively equal distributions of power, war is less likely, and 2) under unequal distributions of power, war is more likely, 3a) the weaker state may initiate war in an attempt to restore the balance or 3b) the stronger state may initiate war in order to pursue its aggressive tendencies.

*Power Transition Theory*

The power transition explanation is based on: 1) an *s*-shaped development of a typical nation's power over time and 2) a logic gov-
cerning the interaction of nations at different positions in their development (Organski, 1958).

According to Organski (1958), a nation’s power growth is internally driven by the natural processes of development, modernization, and industrialization. A typical nation thereby experiences three stages of development: 1) potential power, 2) transitional growth in power, and 3) power maturity (Organski, 1958:340). These stages are descriptive of portions of an s-shaped curve. This curve, as shown in Figure 1, measures a nation’s power across time. Initially a nation’s power grows gradually while its economy and political system are still underdeveloped. In the transitional stage, a nation experiences rapid growth as its economy industrializes and as its government bureaucracy expands. Finally, the growth levels off, and possibly declines vis-à-vis other nations experiencing rapid accumulation of power in their second stage of development.¹

**Figure 1 - Three Stages of Development**

Because all nations do not develop simultaneously, at any given time there will be a mix of nations at various points in their stages of development. The power transition explanation is principally concerned with nations at the most developed stages.¹ Some of these nations will not be “satisfied with the way the international order functions and the leadership of the dominant nation” (Kugler and
Organski, 1989:73), and as their power levels approach that of the dominant nation, they will be increasingly able to act upon this dissatisfaction. It is at this time, when the dominant nation is overtaken by a dissatisfied powerful nation, that war is most likely. The overtaking nation initiates such a war because it “anticipates greater benefits and privileges if a conflict is successfully waged than if the current status quo is preserved” (Kugler and Organski, 1989:175). War is least likely when the dominant nation’s power far exceeds that of the others because the dominant nation has no reason to initiate a war (it gains nothing), and because the others do not possess enough power to initiate war (the probability of success is low). This rationale is similar to that found in Bueno de Mesquita’s (1981) expected-utility analysis of war initiation.

Transition scholars expect not only that war is most likely near power transitions, but that it is most likely just prior to them. For example, Organski and Kugler suggest that “it is an attempt to hasten this passage that leads the faster-growing nation to attack” (1980:28). By implication, this motivation exists only before the transition takes place.

In sum, the key propositions of the power transition explanation are: 1) war is least likely when one nation’s power is clearly dominant, 2) war is most likely when another nation’s power threatens to overtake that of the previously dominant nation, and 3) the overtaking nation is the likely war initiator.

Mixed Results

Empirical analyses purporting to uncover the underlying relationship between power and war produce mixed results. Organski and Kugler’s (1980) analysis of all major power dyads produces results that fail to disconfirm either theory. The evidence supporting the balance of power theory includes these observations: 13 of the 19 wars occur when the rival nations are unequal, and war is non-existent between balanced dyads that do not experience a transition. The evidence supporting the power transition theory includes the following: when one rival is overtaking the other, war is more likely than when there is not a transition, and when the distribution of power is unequal, war is avoided more than 85 percent of the time (Organski and Kugler, 1980:51). When only contender dyads—the dominant state paired with any other state with a power level equivalent to 80 percent of the dominant state’s—are considered, balance of power theory is supported by the complete avoidance of war under the condition of equality with a lack of transition. Power transition theory is
supported because war only occurs when one rival is overtaking the other, and when the distribution of power is unequal, war is always avoided (Organski and Kugler, 1980:52).

Houweling and Siccama expand the universe of analysis and conclude that “differential growth rates and specifically power transitions among great powers are indeed a potent predictor of consecutive outbreak of war” (1988:101). However, their results, like Organski and Kugler’s (1980), clearly indicate that a dyadic balance in which neither side overtakes the other is more likely to produce peace than to produce war regardless of the classification of dyads as major powers or as contenders. The picture emerging from these results is one in which equality produces peaceful interactions, movement away from equality and toward disparity leads to war, and further movement toward a great preponderance for one nation returns the scene to pacifism. At the systemic level, Singer, Bremer, and Stuckey (1972) found that balance of power theory was supported in the 19th century whereas power transition theory was supported in the 20th. Mansfield’s (1992) work helps to explain how different theories can hold for different centuries by showing that the relationship between the concentration of power in the system and the amount of war in the system is best described with an inverted-U shaped curve. In other words, complete equality and complete hegemony are both peaceful while the mid-point between them is the most war-prone. The left-hand side of the inverted U roughly approximates balance of power theory and the 19th century while the right-hand side mimics power transition theory and the 20th century. These findings are consistent with the dyadic level findings. There seems to be simultaneous support for both the balance of power and power transition arguments. In other words, each makes sense, but under different conditions.

INTEGRATING BALANCE OF POWER AND POWER TRANSITION THEORIES

Because each theory demonstrates both logical merit and empirical support, my modeling goal is not to settle the balance of power-power transition debate by choosing sides. Instead, I use the debate as a means of suggesting key variables in the power-conflict story and the ways in which these variables might be related. This approach allowed me to integrate the two theories into a single framework. This was accomplished by assuming that each is right some of the time. Other authors also suggest that the integration of these two seemingly opposed theories is the better route (Bueno de Mesquita,
1989; Wolfson, Puri, and Martelli, 1992). My theoretical contribution is found in the choices I made concerning which theory to draw on at which point in time or under which conditions.

Another integrative theoretical contribution of this dissertation is found in the decision to extrapolate from theories about war initiation to a more general view of conflict behavior. Recall that the balance of power theory postulates that a rival concerned with the power level of its opponent might use conflict behavior as a method of diminishing this power and thereby adjusting the dyadic power distribution toward a more favorable one. Other examples of the movement toward general conflict theories include empirical studies of the relationship between dyadic power distributions and lower levels of conflict (Garnham, 1976; Geller, 1993; Geller, 1996). Further generalization from war to conflict behavior has been achieved in the events data movement. Here, conflict ranges from mild disaffection for another nation’s policies to interstate war (Azar and Havener, 1976). Many events data proponents and formal modelers also consider conflict to be the opposite of cooperation (Richardson, 1960; Axelrod, 1984; Goldstein, 1995). This perspective is particularly useful in my effort to trace the evolution of behavior through various stages of severity or intensity. The net effect is to refocus the discipline’s attention on a larger, more comprehensive theory.

At the same time, a less myopic look at the power-conflict relationship makes a contribution to the substantive understanding of international conflict by integrating two opposed schools of thought. The power transition and balance of power explanations of war are typically portrayed as competing stories. Not only are the theories treated as competitors, so are the implications gleaned from empirical data. When authors find support for one story, they believe it simultaneously contradicts the other story (viz., Houweling and Siccama, 1988; Organski and Kugler, 1980; Siverson and Sullivan, 1983). After assessing the quality of the research bolstering each explanation of war, researchers then determine which side in the dispute claims the “greater weight of evidence” (Siverson and Sullivan, 1983:475). Findings placed on the balance of power side of the scale offset those placed on the power transition side, and vice versa. This type of reasoning is comfortable because it is akin to the standard social scientific practice of confirming a working hypothesis by rejecting the null hypothesis. Such an approach may allow us to accumulate knowledge in what Zinnes (1976) calls an “additive” fashion, but it does not contribute much to the “integration” of find-
ings into unifying theories. Most and Starr levy the same complaint in the introduction to their book:

analysts' descriptive sense of international relations and foreign policy phenomena has substantially expanded in quantity and quality. New data sets exist. Scholars cite one another. The understanding of a variety of analytical techniques has greatly improved. In terms of ... "integrative' cumulation," however, the record is generally much less impressive. ... Many argue that theoretical understanding has not been greatly advanced. The results do not seem to add up very readily; there is great difficulty in synthesizing seemingly disparate work. Researchers do not seem to be identifying solutions to the theoretical, methodological and policy problems that challenge them. The field seems incapable of bringing closure to important theoretical and empirical questions. (1989:1-2)

This dissertation does not unify the entire field of international relations, but it does accomplish the task of integrating one specialized area of study, namely the distribution of power between two rival nations and its relationship to conflict. The method of integration used here may, however, suggest a useful technique for similarly plagued areas of research.

WHY USE A DYNAMIC MODEL?

The stories told by Organski (1958) in The Stages of Development and by Morgenthau (1985) in Politics Among Nations are rich in dynamical descriptions of national growth and competition. The former details the processes of economic, social, and political development. The latter elaborates the forces pushing nations to strive toward power preponderance, and the forces countering in order to maintain an equitable balance of power. These two stories have in common the idea of change over time. Contemporary authors attempt to capture these fluctuations by incorporating pseudo-dynamic features into their statistical investigations (Organski and Kugler, 1980; Houweling and Sicamma, 1988; Kim, 1989; Singer, Bremer, and Stuckey, 1972; Doran and Parsons 1980; Spieżio, 1993). Thus far, this approach has not proved satisfying.

Investigators using statistical approaches attempt to determine the effect of dynamic components of the two power theories by devis-
ing variables that measure some dynamic element at various points in time, such as whether or not the challenger's growth rate is larger than that of the dominant nation (Organski and Kugler, 1980; Houweling and Sicamma, 1988), the relative growth rate of the challenger and dominant state (Kim, 1989), whether or not a nation is at a critical point (a point at which the change in power is greatest or least) in its power cycle (Doran and Parsons, 1980; Spiezio, 1993), and the level of change in power distribution (Singer, Bremer, and Stuckey, 1972; Mansfield, 1992). These empirical studies reveal strong dynamic effects but do little to explain how those effects work. Although they are important first steps, they are only able to provide snapshots in time. The next step is to use these suggestive snapshots to piece together a movie. A differential equations model is the most suitable method of doing so. As I will explain below, a differential equations model allows us to explore not only how power and conflict behavior evolve over time, but also how they interact with one another.

Given the past literature's strong theme of changing power levels and power relationships over time and the importance of those changes in determining conflict, as well as the proposition that conflict levels dynamically affect power distributions, I abide by Lave and March's first rule of modeling social phenomena. "Rule 1: Think 'Process.' A good model is almost always a statement about a process, and many bad models fail because they have no sense of process" (1975:40). Furthermore, I choose differential equations as a modeling tool, or formal language, with which to explicitly and rigorously record my ideas due to their excellent ability to capture both the notion of change over time and the interdependent nature of key variables (an important feature of the power-conflict story), the two main ingredients of a process. The change in some variable, $x$, over time is typically expressed as $\frac{dx}{dt}$. Eliminating the independent/dependent variable distinction is accomplished by specifying a system of differential equations in which $\frac{dx}{dt}$ is dependent on, among other things, a second variable, $y$; and $\frac{dy}{dt}$ is dependent in some way on $x$.

THE FORMAL MODEL

The formal model developed in this dissertation grew out of my simultaneous exposure to three interesting sets of ideas: 1) the use of a first order differential equation to understand population dynamics (Mesterton-Gibbons, 1989; Pearl, 1924), 2) the speculation that national power development evolves over time according to an s-shaped curve similar to that generated by the population growth
model (Doran, 1971, 1989a, 1989b; Doran and Parsons, 1980; Organski, 1958), and 3) two seemingly opposed beliefs relating the likelihood that two rival nations will go to war with the relationship between their power levels—the balance of power explanation of war (Kissinger, 1979, 1994; Claude, 1962; Morgenthau, 1985) and the power transition explanation (Organski, 1958; Organski and Kugler, 1980). Immediately, I was struck by the potential for research in the first two areas to inform that done in the third. Moreover, I was surprised by the failure of international relations scholars, especially those interested in the relationship between the distribution of power and interstate war, to draw on the population modeling literature to better understand the growth in national power levels over time.

**Power Equations**

The story presented in the formal model begins with a query. How might population models tell us something about modeling the growth of national power? In order to answer that question, I briefly present the typical biological model which produces a picture of a species' population evolving over time in a manner such as that depicted in Figure 1. The equation responsible for generating this picture is of the form:

\[
\frac{ds}{dt} = \lambda s \left(1 - \frac{s}{K}\right)
\]  

[1.1]

where:

- \( s \) is the total number of individuals in a species' total population at a given time,
- \( ds/dt \) is the change in the population level over time,
- \( \lambda \) is a positive constant representing the instantaneous birth rate, and
- \( K \) is the carrying capacity, or the population level that resources can, in the long run, sustain

Equation [1.1] can be rewritten as:

\[
\frac{ds}{dt} = \lambda s - \frac{\lambda}{K} s^2
\]  

[1.2]

The first term, \( \lambda s \), is responsible for growth in the species' population. The second, \( \lambda s/K \), represents a force causing the population to diminish. The two terms compete, in a sense, for dominance over \( ds/dt \). Note that as \( s \) approaches \( K \), the carrying capacity, the second term's influence has an increasing effect. This biological process is
self-driven; it depends on no external factors. A population naturally expands over time until it reaches a level that resources can sustain.

Organski (1958) proposes that growth in national power is similarly governed. According to him, a nation generally experiences three stages of development: 1) power potential, 2) transitional growth, and 3) power maturity, as represented in Figure 1. The model begins by borrowing a portion of the biological model and applying it to national power growth. Specifically, I use the first, or natural growth term of equation [1.2]. Note that this growth term is also consistent with the balance of power theory proposition that nations constantly seek to maximize their power. Rewriting just that piece of the equation for national power yields:

\[
\frac{dp}{dt} = \alpha p \tag{1.3}
\]

where:

- \( p \) is a nation’s power level at a given time,
- \( \frac{dp}{dt} \) is the change in a nation’s power level over time, and
- \( \alpha \) is a positive constant representing the instantaneous growth rate

Equation [1.3] is the first step in modeling the patterns in national power development over time. Given this assumption that the rise in national power is a function of the level of power itself, I then ask what forces might pull the level of national power down. Rather than relying on the exhaustion of resources as a nation approaches some maximum power level, I tell a different story.

That story begins with the realization that a nation’s power development does not take place in a vacuum. In other words, it is only a partially self-driven process. The balance of power and power transition theories suggest that at least two other factors are involved. The first factor is a rival nation’s power level, which also develops in stages, and which impinges on that of the initial nation. This second nation’s power level, as it grows, may overtake that of the first. The point at which nation X is surpassed by nation Y is called a “power transition” (Organski, 1958; Organski and Kugler, 1980). If these two nations are competing for dominance of one another, as in an interstate rivalry, nation X will try to diminish nation Y’s growth, and vice versa. Nation Y’s success (and nation X’s) will be highly dependent on its own power level. In other words, nation X’s growth, \( \frac{dp_X}{dt} \), is dependent on Y’s power level, \( p_Y \), as well as on its own, \( p_X \).
What method of reducing nation X's power growth does Y have at its disposal? In the above summary of balance of power theory, I proposed that conflict is the primary means for competing in this manner. The change in nation X's power is therefore also driven down by the conflict nation Y directs at it, \( c_{yx} \). The negative effects of nation Y's power and conflict behavior can be appended onto the natural growth component in equation [1.3]:

\[
\frac{dp_x}{dt} = ap_x - f(p_y, c_{yx})
\]  

[1.4]

where:

- \( p_x \) is nation X's power level,
- \( p_y \) is nation Y's power level,
- \( c_{yx} \) is the conflict Y directs at X, and
- \( f(p_y, c_{yx}) \) is here an unspecified function.

Similarly, Y's growth, \( dp_y/dt \), is dependent on its own power level, \( p_y \), that of its opponent, \( p_x \), and the conflict the opponent directs at it, \( c_{xy} \). In order to keep this presentation brief, I do not develop the specific functional form of the second term on the right-hand side of equation [1.4]. However, it is developed in the dissertation.

**Conflict Equations**

What influences the conflict behavior of each rival? There are two forces acting on a nation's conflict behavior toward its rival: reaction to the conflict from the rival, tempered by the nation's own abilities and the distribution of power between the nation and its rival. The first force is explicated here in detail, but the second is only summarized.

Imagine that conflict behavior is simply the flexing of a nation's power. The more power a nation has at its disposal, the more it is actually able to use. In a competitive dyadic rivalry, the use of national power is manifested in conflictual behavior. It can therefore be said that nation X is able to direct increasing amounts of conflict toward nation Y as it is increasingly powerful. Because a nation's ability to act conflictually is dependent on its level of power, i.e., \( c_{xy}(t) = f(p_y) \), the two concepts of power and conflict are intimately linked. Thus, I begin building the conflict equations with the following:

\[
\frac{dc_{xy}}{dt} = \gamma_x p_x
\]

[3.5]

and
\[ \frac{dc_{yx}}{dt} = \gamma_y p_y \]  \[ [3.6] \]

where \( \gamma_x \) and \( \gamma_y \) are positive constants.

If national power enables rivals to act conflictually, what makes them motivated to act more or less conflictually? I start by discussing a fundamental force that motivates a nation to direct increasing amounts of conflict toward its opponent. According to Morgenthau (1985:192-194), in a balance of power setting, rival nations act to counter each other using a “pattern of direct opposition.” If conflict is the means by which nations oppose one another, then we can take this to mean that nation X is increasingly conflictual toward nation Y because nation Y is increasingly conflictual with nation X.

Incorporating the motivating force into equations [3.5] and [3.6] produces this pair of equations:

\[ \frac{dc_{xy}}{dt} = \gamma_x p_x c_{yx} \]  \[ [3.7] \]

and

\[ \frac{dc_{yx}}{dt} = \gamma_y p_y c_{xy} \]  \[ [3.8] \]

These equations might be compared to the action-reaction terms in Richardson’s (1960) arms race model, where the increase in one nation’s armaments causes an increase in the opponent’s armaments. Equations [3.7] and [3.8], however, modify the action-reaction component of conflict with the effect of national power. Furthermore, note that when either nation X’s power level is zero \( (p_X = 0) \) because nation X no longer exists) or Y ceases hostilities \( (c_{yx} = 0) \), then X’s conflict toward Y will no longer increase \( (dc_{xy}/dt = 0) \). This captures the idea that both the ability to act and the motivation to act are necessary in order for a nation to become increasingly conflictual. The conflict equations expressed in [3.7] and [3.8] capture the primary forces governing conflict behavior. The ability and motivation to act conflictually endure regardless of the particular condition experienced by a rivalry.

I previously argued, however, that one of the integrative contributions of my model is its capacity to specify certain conditions under which each of the two original logics makes sense. Another way to put this is that the model accounts for different forces coming into play under different conditions. Recall that empirical investigations reveal these conditions. Long-term parity is peaceful, situations
in which one state gains a modest but noticeable advantage are conflictual, and overwhelming preponderance re-establishes peace. The second component of the conflict equations accounts for this by taking a different functional form for each of the three regions. As a result, movement from the approximate parity toward the noticeable advantage region produces more conflict from both nations. Conflict behavior in the noticeable advantage region is based on consolidation efforts of the stronger and preventive efforts of the weaker. Conflict in the overwhelming preponderance region diminishes, based on the submission of the weaker state and complete dominance of the stronger. The movement from the first to the second region can be thought of both as a power transition and as a movement toward inequality, precisely the scenarios considered dangerous by power transitionists and balance of power scholars, respectively. At the same time, nations that remain in the first condition of approximate parity without one gaining a noticeable advantage will experience relatively little conflict. Such a setting is consistent with both balanced peace and quiet non-transitions. The passage from the noticeable advantage to overwhelming preponderance and the concomitant decrease in conflict simultaneously represents the tranquility of preponderance and the futility of fighting against a state with whom there can be no hope for rivalry. The dissertation itself specifies the precise functional form of the conditional conflict behavior.

DEDUCTIONS FROM THE MODEL

There are a variety of ways in which one might seek deductions from the power-conflict model. I choose to begin by focusing on a specific substantive question. In particular, I am interested in whether transitions are peaceful or conflictual and in the type of power relationships that produce and result from transitions. The issue of whether transitions are peaceful or conflictual is an interesting one which arises from the balance of power-power transition debate. The dynamic model should provide expectations of its own concerning conflict behavior near power transitions. It should additionally provide expectations concerning the patterns of power growth and decay before and after a transition.

Expectations or conclusions can be determined from a system of differential equations in one of two fashions. If the system can be analytically solved, the equations are re-written so that they explicitly describe the behavior of $p_x$, $p_y$, $c_{xy}$, and $c_{yx}$ as time passes. If, however, the system cannot be solved analytically, it must be solved
numerically. Once a value is provided for each variable at a particular moment in time, the equations can then generate all subsequent and previous values of $p_x, p_y, c_{xy}$, and $c_{yx}$ through time. As misfortune would have it, the model proposed here requires a numerical solution. Such solutions are more time consuming, and, if not carefully done, can result in large errors in prediction. In their text on differential equations, Edwards and Penney (1985:401-2) reassure the reader that properly executed numerical analysis is a viable alternative to analytic solutions. Several steps are involved in the numerical solution. First, the parameter values are determined. Next, several sets of initial values, or conditions, are selected. Several sets must be used because rigor demands that conclusions not be drawn from special or unique cases. Since the general analytic solution cannot be determined, multiple instances must be used in order to make broad-based claims about the model’s expectations. Third, the equations are seeded with a set of initial conditions from which they determine subsequent and previous values of $p_x, p_y, c_{xy}$, and $c_{yx}$. The equations are then re-seeded with each additional set of initial conditions, which provides several more runs or simulations. Last, the many sets of resulting paths for $p_x, p_y, c_{xy}$, and $c_{yx}$ through time are examined in order to distill the commonalities held across all initial conditions.

Approximately fifty different sets of initial conditions were used to seed the dynamic model. Although each set of initial conditions produced a unique set of trajectories for $p_x, p_y, c_{xy}$, and $c_{yx}$, three distinct patterns of behavior emerged. Each distinct pattern is represented by a single simulation result in Figures 4.1, 4.2, and 4.3. So, while the graphs in Figure 4.1, for example, demonstrate the results of only a single simulation, many other simulation results have similar trajectory behavior. The trajectories in Figure 4.1 can be thought of as a single, representative member of an entire family or class of like trajectories. The three distinct classes of behavior are distinguished primarily by the differences in how national power grows and decays before and after a dyadic power transition. The first is characterized by the challenger’s obvious inability to successfully complete a transition. All trajectories in the second class show the challenger rising to compete with the dominant nation for a period of time before returning to the weaker position. This group might also be characterized by saying that the formerly dominant nation finds a way to recover its lost position. The third class is characterized by a single, distinct transition. The most striking conclusion offered by the power-conflict model is that there are three types of power transi-
tions, only one of which, the single transition, bears a clear resemblance to that envisioned by Organski (1958).

The conflict behavior patterns are also much different from those portrayed by the power transition and balance of power theories. For example, the power-conflict model produces coupled conflict behavior, whereas the traditional theories both predict a high level of conflict from only one rival (the challenger and the preponderant nation). In contrast to the power transition theory, the power-conflict model also predicts dyadic conflict levels to peak after, not before, a power transition. A closer examination of the three types of power transitions yields specialized deductions relevant to each transition type and to the differences in conflict behaviors across the three types. For example, the transition winners for the non-Organski style transitions are not the more conflictual rivals. These specialized deductions also differ from the conclusions reached by transition and balance of power scholars.

TESTING THE DEDUCTIONS

In the dissertation, I use the Correlates of War (COW) project's Composite Indicator of National Capabilities (CINC) as a measure of national power. For the 1816-1985 time period, I identify 42 cases in which one major power's CINC score intersects that of another, and then classify 13 of those 42 power transitions as single transitions, 8 of them as tortoise and hare transitions, and 18 as deflection transitions. Next, I examine the conflict behavior of one empirical example of each transition type. Russia vs. the United Kingdom, 1896-1902, serves as the single case, the U.S.S.R. vs. Germany, 1939-1945, serves as the tortoise and hare case, and Germany vs. France, 1925-1932, serves as the deflection case. For each of these three cases, I use the Militarized Interstate Dispute (MID) data (Gochman and Maoz, 1984; Jones, Bremer, and Singer, 1996). The MID data reflect the highest level of militarized hostilities directed from each of the two states toward the other. By plotting these values across time, I can check for empirical consistency with the power-conflict model's general and specialized deductions concerning conflict behavior.

Because the MID dataset includes only the highest level of hostility by each side and only militarized disputes, I use historical writings to more closely examine the three cases (e.g., Kennedy, 1987; Stoessinger, 1993; Ulam, 1974; Middleton, 1947). These finer-grained case studies indicate that there are many lower level conflict events that play a role in the evolution of these dyadic rivalries.
Figure 4.1 - An Example of a Deflection

px(0) = py(0) = 10, cxy(0) = 50, cyx(0) = 10

power levels

|px| py|

| time |

power relationship

|px-py|

|d*-7|

|d^-15|

| time |

conflict behavior

cxy
cyx

| time |
Figure 4.2 - An Example of a Tortoise and Hare Transition

\[ px(0) = py(0) = 10, \ cxy(0) = 10, \ cyx(0) = 6 \]
Figure 4.3 — An Example of a Single Transition

\[ px(0) = py(0) = 10, \ cxy(0) = 10, \ \text{cyx}(0) = 50 \]
Overall, the empirical results match the model's predictions.

CONCLUSION

Making an objective judgment concerning the ability of the power-conflict model to help us understand the world of international relations is somewhat difficult because, as Lave and March caution, researchers run the risk of "falling in love" with their models (1975:60), much as fiction writers may find themselves particularly fond of a character in one of their novels. Toward the end of minimizing the impact of this amorous tendency on the evaluation process, I propose two general criteria. Decisions to discard, retain, or modify the power-conflict model should be made by considering whether or not there is empirical support for the power-conflict model's predictions, and how well the model performs against the balance of power and power transition alternatives.

The power-conflict model performs better than these alternatives in several ways. Most obviously, it accounts for two additional types of power transitions—deflections and tortoise and hare cases. Independent work by Wayman (1996) confirms the existence of these two types of transitions. These new types of transitions are useful because they explain and predict challenger failures. The analysis of MID data, supplemented with historical analysis, generally supports the unique conflict patterns associated with the three transition types. Advice for rivals in each type of transition is given. Tortoises, for instance, should bide their time. They need not waste excessive resources competing with opponents who exhaust themselves.

In addition, the expectations for general conflict patterns are supported over related predictions from the two traditional schools of thought. The coupling conclusion tells us that identifying which nation is the first to attack, an issue emphasized by both schools, does not appear to be a useful task. Predicting which nation will initiate war has less bearing on the prescriptions for peace than does understanding the underlying process driving the long-term ebb and flow of dyadic conflict. Slowing down reaction rates is one potential solution that addresses that process. The timing conclusion tells us that the most dangerous period follows power transitions. Rivals entering this stage should be cautious.

These conclusions also come with some suggestions for improving international relations data and the model itself. Supplementing the MID data with historical analyses reveals that other types of events are important. Non-militarized conflict and cooperative inter-
actions greatly contribute to our understanding of dyadic behavior patterns. A project to collect these types of events data for major powers in the late 19th and early to mid 20th century is currently underway.\(^1\) The historical analyses also brought to light the importance of allies. When a rival forms an outside alliance, it does not simply have the effect of augmenting its power base. The opponent reasonably sees this as a conflictual act aimed at it. When the Anglo-Japanese alliance was initially formed in 1902 and later renewed in 1905, the purpose was to counter Russian strength more effectively than could either Britain or Japan alone; and both events were clearly perceived by Russia as hostile actions directed at it on the part of the other two nations. One possible way to incorporate these ideas into the model would be to develop a variable that captures how two nations draw closer together (or further apart) time. A similar “relationship” variable is the subject of work by Lee, Muncaster, and Zinnes (1994).

This synopsis serves to highlight some of the basic features of the power-conflict model, the model’s predictions, empirical support for those predictions, and important conclusions from the model and its analysis. Beyond encouraging readers to investigate the full Story, I hope to motivate them to theorize about the fascinating dynamics of international relations.

ACKNOWLEDGEMENT

Generous thanks are due to a multitude of people for their help and patience. Dina Zinnes, Robert Muncaster, Paul Diehl, Frank Zagare, Jacek Kugler, Jack Levy, T. Clifton Morgan, Gary Segura, Paul Hensel, Jerry Sorokin, Elizabeth Martin, Jerry Loewenberg, and Rebecca Morton have all given useful comments and advice. Gretchen Hower helped interpret some of the earliest simulation results. Erik Gartzke provided an independent classification of all of the empirical transitions against which I could check my own classification decisions.

NOTES

1 Garnham (1976) refers to these two views of power and conflict as “opposing opinions.” Bueno de Mesquita (1989) calls them “fundamentally different hypotheses” and states that they “seem diametrically opposed” and “incompatible.”

2 Emphasis added.

3 The term “equilibrium” is used in a non-technical sense in the bal-
ance of power literature.

4 Further justification for moving from systematic to dyadic analysis is presented by Siverson and Sullivan (1983:474) who claim that "the underlying rationale for the hypothesis at both levels is similar enough—at least in terms of general theory building—that it would be advantageous to compare them." Additionally, the authors concur with Singer's (1980:359) proposition that most system properties come from characteristics of its parts. Lastly, it may simply be the, as it is here, that we are interested in the behavior of a dyad as opposed to the behavior of a system of nations.

5 This is because Organski sees economic, political, and social development as closely related, but not equivalent to, power in the international system since "power" is a relative concept. Ultimately, however, only the growth of power is operationalized, so the discrepancy becomes irrelevant.

6 Less powerful nations are only of interest later on in their development.

7 Emphasis in original.

8 Throughout this dissertation, I refer to the sixth edition of Morgenthau's Politics Among Nations (1985), a revision of the fifth edition done by Kenneth Thompson following Morgenthau's death. I chose to cite Morgenthau alone as the portions of the book to which I refer have not been altered by Thompson, whose substantial revisions are primarily found in sections on "human rights, détente, and the nuclear problem." (Thompson's Preface to Morgenthau, 1985:vi). Readers interested in the historical placement of Morgenthau's balance of power ideas might note that the first edition was published in 1948.

9 The idea that conflictual behavior depletes national power is captured indirectly in the second term of the power equations. The depletion can be thought of as an expenditure made in order to respond to the opponent's conflict. The response, an action in itself, is conflictual in nature, and requires the expenditure of power reserves.

10 This is reminiscent of Most and Starr's "pre-theoretic" framework for understanding international politics, which is based on the organizing concepts of "opportunity and willingness" (1989:23-46). "Opportunity" is seen as the "possibilities that are available within any environment," and "willingness" is seen as the "choice (and process of choice) that is related to the selection of some behavioral option from a range of alternatives" (Most and Starr, 1989:23).

11 I also use the words "predictions," "implications," and "deductions"
to refer to conclusions that can be reached by logically or mathematically analyzing a formal model.

12 The process by which parameter values were selected is discussed thoroughly in the dissertation.

13 This procedure was done using the Mathematica software developed by Wolfram (1996).

14 Although Azar’s (1980) Conflict and Peace Databank (COPDAB) and McClelland’s (1971) World Events Interaction Survey (WEIS) datasets do include these lower levels of conflict, the very recent time period covered by each is relatively short and overlaps only a handful of empirical power transitions among the major powers.

15 The National Science Foundation has provided me with funding for this collection effort (Grant SBR 98-06123).

REFERENCES


