# Emergent Polarity:
# Analyzing State-Formation and Power Politics

LARS-ERIK CEDERMAN

*The University of Michigan*

Neorealism focuses solely on how states maintain balance of power equilibria, neglecting the dynamic process by which these states consolidated their power. The present study evaluates neorealist propositions by bringing them to bear on both the emergence and the consolidation of the state system, asking not only why certain polarity structures maintain themselves but also why they emerge in the first place. To analyze this issue, I present a computer model that (1) provides an explicit spatial representation of the international system; (2) involves a large number of actors; (3) endogenizes the outer boundaries of these actors as well as the polarity structure of both the regional and global structure; and (4) endows these agents with a bounded and historically contingent decision scope. The simulation findings cast the neorealist arguments in a new, dynamic light. As expected by structural realists, unit-level factors play a subordinate role, but only under conditions of violent and persistent interstate competition. Contrary to what is usually believed, defensive technology and alliances are likely to lead to unipolarity rather than contribute to stability. The collapse of the regional balance in Renaissance Italy illustrates how the difference between regional and global alignments may undermine the systemic balance. Finally, I argue that these theoretical qualifications should discourage exaggerated faith in strategic *laissez-faire* in contemporary Eastern Europe.

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The fact of our irremediable ignorance of most of the particular facts which determine the processes of society is . . . the reason why most social institutions have taken the form they actually have. To talk about a society about which either the observer or any of its members knows all the particular facts is to talk about something wholly different from anything which has ever existed—a society in which most of what we find in our society would not and could not exist and which, if it ever

occurred, would possess properties we cannot even imagine. (Hayek, 1973:13).

The end of the Cold War served as a healthy reminder that states constantly form, disintegrate, and change. Having focused on the exceptionally stable postwar environment of superpower relations, International Relations scholars were ill prepared to account for the events triggered by the fall of the Berlin Wall. This is particularly true of the dominant paradigm in International Relations, neorealism. Delegating the responsibility for explaining "unit change" to historical sociologists, neorealists focus on the question of why power politics persists among the "great powers." From where these great powers emanate remains an issue well beyond the traditional neorealist research agenda.

The present article challenges this division of labor. As Charles Tilly (1975, 1985, 1990) suggests, state-formation and war are two sides of the same coin. Critics of neorealism have pointed out that any general theory of international politics needs to explain the origin of its main actors (e.g., Ashley, 1986; Wendt, 1987; Ferguson and Mansbach, 1988). Instead of rejecting neorealist logic, however, this article puts it on a dynamic footing by bringing it to bear on the process of state-formation. This perspective requires the theory not only to explain why balance of power systems maintain themselves; it also calls for an account of why an initial system featuring many small political units tends to crystallize into stable rivalry among a small number of great powers. Thus, rather than to refute neorealism, the goal is to apply its logic to a wider historical context and to establish the conditions under which its main tenets hold.

To conceive of power politics as a historical process presupposes that some states disintegrate; other states grow territorially; and system structure, especially polarity, emerges from what actors do rather than being fixed beforehand by modeling assumptions. Such an exploration requires an explicitly dynamic and spatial framework that allows for a higher degree of complexity than neorealist models in the microeconomic tradition can offer. To that end, I present a model that (1) provides an explicit spatial representation of the international system; (2) involves a large number of actors; (3) endogenizes the outer boundaries of these actors as well as the polarity structure of both the regional and global structure; and (4) endows these agents with a bounded and historically contingent decision scope. This framework constitutes an "artificial world" of power politics that sets the stage for controlled experiments that would have been impossible to perform in real social systems. As opposed to traditional models, the framework allows for explicit analysis of geopolitical systems featuring a large number of actors with emergent outer boundaries.

This article extends the neorealist logic to the phase preceding great power rivalry by asking the historical question: From where do the great powers come? The extension to state-formation poses a harder challenge to neorealism than its current static focus. Not only does the theory have to explain why the process of power politics does not degenerate into unipolarity, but it also needs to account for the reduction of polarity implied by state-formation. The simulations suggest that in order for the structural core of neorealism to apply, the state system needs to remain highly competitive. Under these conditions, power politics, defined as competition among a small number of great powers, does emerge almost regardless of states' motives.

To guarantee this structural effect, however, it is necessary to postulate a self-feeding predatory process that reduces polarity in the state-building phase. This means that multipolarity is constantly threatened by "hegemonic takeoffs," that is, predatory quests for global domination. As long as the geopolitical expansion of the strongest states is well-balanced, balance of power will prevail. Yet this outcome requires competition to be free from intervening disturbances, such as

excessive strategic defense-dominance or regional alliances. These defensive mechanisms widen the window of opportunity for potential hegemons, increasing the likelihood of unipolarity. Thus, contrary to what most realist thinkers assert, there is a potential contradiction between global system stability on the one hand, and defense dominance and defensive alliances on the other hand. Against the backdrop of the market analogy on which neorealism is based, this should not come as a surprise. Economists believe that cartels, or any other attempts to inhibit competition, disturb the operation of the "invisible hand" in economic markets.

The article is organized as follows: Section 1 outlines the theoretical arguments to be evaluated and refined. Section 2 provides a brief overview of the geopolitical model, followed by a more detailed description in Section 3. Section 4 presents the comparative results of the simulations of the basic system. Section 5 adds the alliance mechanism and provides a historical illustration focusing on regional balancing in Renaissance Italy. The last section sums up the theoretical conclusions and discusses some policy implications.

## 1. Power Politics and Emergent Polarity

Neorealists study the interaction among given actors, commonly referred to as great powers, forming a system of power politics. These scholars usually seek to explain the occurrence of war by reference to the distribution of power in the system, most notably system polarity. The literature has attempted to resolve whether bi- or multipolarity is conducive to system stability (for a review see Levy, 1989). Structural change, by contrast, regularly falls outside the explanatory scope of neorealist analysis. This does not prevent these theorists from referring to evolutionary mechanisms (Waltz, 1979:118), but as in neoclassical economics these references are implicit (cf. Friedman, 1953). Like microeconomics, neorealism lacks a convincing theory of institutional change. Consequently the identity of the actor as well as system structure are treated as given, something that makes it hard to study historical change of the type that the international system is currently undergoing (Kratochwil, 1993).

Instead of treating system behavior, such as war, as the only dependent variable, this article focuses on the development of system polarity over time. In this perspective, war and conquest are side effects of the more fundamental process of integration and disintegration. By plotting system polarity as a function of time, Figure 1 illustrates this dynamic graphically. Most historical balance of power systems emerged from a large number $N$ of small political units. As a rule, the emergence of power politics involves two phases. First, in the initial contraction phase, repeated conquest reduces polarity dramatically. Second, after the state-building process, a consolidation phase follows in which the system may or may not stay within the bounds of power politics. For the purposes of the present analysis, power politics is defined as a system of great power competition with significantly reduced polarity (i.e., a low $N$ of, say, at most 10% of the original number of states) but that does not degenerate into universal empire.

This development corresponds to an important historical pattern. The European state system followed a similar path as it contracted from about 500 units in 1500 to some 20 states in 1900 (Tilly, 1975:24). Other examples include Italian and Greek systems of city-states, ancient India and China, and other early examples of empire- and state-building (see Cusack and Stoll, 1990).[1]

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[1]This depiction of power politics entails two important simplifications. Though wider, the time scope is still bounded because the explanation does not account for the multitude of small states that emerge. A more complete
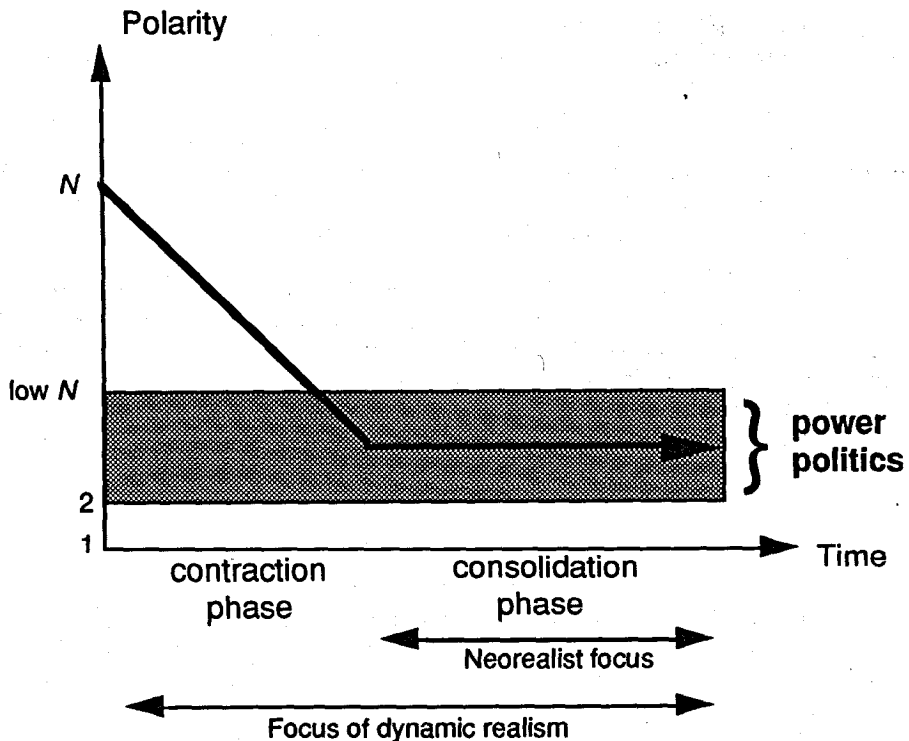
FIG. 1. The emergence of power politics.

Conventional neorealist accounts of power politics tend to center on the consolidation phase only. Tacitly assuming that the process of integration has already taken place (and that it has not already degenerated into unipolarity), neorealist analysts focus their attention on why the system equilibrium maintains itself. This static "problem-solving" approach makes explanation easier, but only at the price of assuming away important historical processes (Cox, 1986). As Henry Nau (1993) points out, a system characterized by large numbers of small actors is qualitatively different from one composed of a small number of great powers.

To provide a full account of the emergence of power politics, an extended, dynamic theory needs to explain both why polarity decreased and why it did not result in unipolarity. Figure 2 offers a conceptual guide to this puzzle. A complete theory needs to go beyond structuralist causation by relying explicitly on at least two causal mechanisms.[2] The first one is predation and constitutes

theory needs to account for both state-formation and imperial collapse. In fact, the European state system emerged as a result of the Roman Empire's disintegration. Moreover, the current analysis assumes that, though states' outer boundaries change, the nature of the units is constant. See Ruggie (1993) and Spruyt (1991) for more nuanced discussions of how the modern nation-state was selected from a number of alternative organizational forms including empires, city-states, and city leagues.

[2]It is clear that anarchy does not by itself account for variations in system polarity. Anarchy, or more precisely the absence of international enforcement, explains why states have to be ready to counter aggression, but it does not reduce polarity and it has little to say about why unipolarity can be avoided. Waltz (1979) is aware of the flaws of primitive structuralism: "Agents and agencies act; systems as wholes do not. But the actions of agents and agencies are affected by the system's structure. In itself a structure does not directly lead to one outcome rather than another. Structure affects behavior within the system, but does so indirectly" (p. 74). Though he specifically refers to "socialization" and "competition" as the primary "transmission-belts" between structure and agency, the
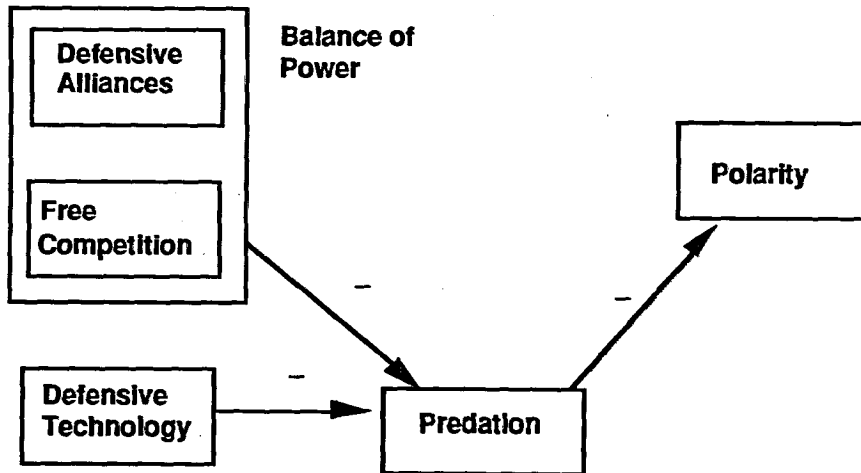
FIG. 2. Static scheme explaining the emergence of power politics.

the unit-level "engine" driving the process of system integration. If not stopped, predation is likely to reduce system polarity. The second mechanism, balance of power, slows down the first process through deterrence based on defensive alliances or unfettered power competition. In addition to these mechanisms, some realists argue that a third mechanism influences the predatory process, namely, the defense/offense dominance of military technology (e.g., Jervis, 1978; Van Evera, 1984; Snyder, 1984, 1991).

This simple causal scheme calls for clarification on two points. First, how many states have to be predatory in order for the system to contract? The neorealist assumption that actors are self-regarding and selfish does not tell us whether their ambition is mostly to survive or to expand (Keohane, 1983; Schweller, 1993). Focusing on systemic determinants of action, Waltz (1979) glosses over this important distinction by stating that states are "unitary actors, who, at a minimum, seek their own preservation and, at a maximum, drive for universal domination" (p. 118).[3]

Second, despite its celebrated role in realist thought, balance of power is a notoriously diffuse term (Haas, 1953; Claude, 1964; Levy, 1989). The question is whether power politics requires alliances to prevent unipolarity. Here the realist views range from a completely decentralized, alliance-free system auto- matically stabilized by "internal balancing," to a more coordinated system relying on "external balancing" through defensive alliances (Claude, 1964; see Cusack and Stoll, 1990:40–53, 138–140 for a review). The latter category encompasses a wide variety of cases including local ad hoc alliances, formed to block the expansion of threatening neighbors, as well as more centralized balance of power strategies such as collective security arrangements and great power concerts (cf. Kupchan and Kupchan, 1991). Generally, the neorealist literature does not disentangle the effect of internal and external balancing, thus doing little to dispel "a more general failure to identify the conditions under which alliances

argument remains mainly implicit on this point. Jon Elster (1985) offers a clear discussion of the need to specify the underlying mechanisms to support functionalist and structuralist explanations. See also Wendt (1992) for an interesting attempt to uncover the explanatory mechanisms of neorealist theory.

[3] It should be noted that Waltz is not entirely consistent. At other places Waltz (1979) leans toward characterizing states as predominantly status quo oriented: "The first concern of states is not to maximize power but to maintain their positions in the system" (p. 126).

are stabilizing and the specific conditions under which they are destabilizing"
(Levy, 1989:235).

The current study explores a set of neorealist propositions associated with a
decentralized notion of power management rather than the more conscious or
"manual" types of balancing common in classical realism. Drawing heavily on
the microeconomic market analogy, the neorealist approach to power politics
has been labeled "relaxed realist" since it downplays the difficulty of achieving
balance (Claude, 1989). The actors are animated by narrowly selfish motives
rather than a concern for global stability. It is assumed that international stability
emerges as an unintended consequence of the states' "micromotives" (Schelling,
1978). The most prominent exponent of this view is Kenneth Waltz.

> International-political systems, like economic markets, are formed by the coac-
> tion of self-regarding units. International structures are defined in terms of the
> primary political units of an era, be they city states, empires, or nations. Struc-
> tures emerge from the coexistence of states. No state intends to participate in
> the formation of a structure by which it and others will be constrained. Inter-
> national-political systems, like economic markets, are individualist in origin,
> spontaneously generated, and unintended. In both systems, structures are
> formed by the coaction of their units. (Waltz, 1979:91)

This study employs three independent variables. First, the *proportion of pred-
ators* refers to the density of predator states at the outset of the analysis. Second,
*defense dominance* stands for how hard the predators judge attack to be. To be
more precise, I follow Scott Sagan (1986:161) in defining this variable as the
required superiority in order to achieve victory expressed as a force ratio. Finally,
the presence of *defensive regional alliances* entails the possibility of external bal-
ancing against immediate threats from neighboring states. In their absence, all
states are forced to rely on their own means to ensure survival. Again it should
be emphasized that I am *not* investigating the influence of globally managed
alliances (though great powers will automatically be more concerned about
system stability since they share borders with more states than do lesser powers).

Having specified the explanatory factors, it is now possible to state the prop-
ositions to be evaluated. Each proposition relates one of the independent vari-
ables to the likelihood of power politics. The first proposition, which represents
the most orthodox form of neorealism, is the most sweeping one. The other
two assertions constitute refinements of the first one drawn from contemporary
realist scholarship:

*(P1) Anarchy implies power politics.* This structuralist proposition means that
power politics will follow regardless of unit-level factors such as predatory fre-
quency or defense-dominance. As we have seen, Waltz (1979) discounts unit-
level factors such as the offensive nature of the states: "Balances of power tend
to form whether some or all states consciously aim to establish and maintain a
balance, or whether some or all states aim for universal domination" (p. 119).
Thus the locus of causation is firmly rooted on the systemic level, consistent
with Waltz's famous "third image."

*(P2) Defense-dominance increases the likelihood of power politics.* Jack Snyder (1991)
calls this modification of P1 "defensive realism" since it suggests that defensive
action contributes to system stability. As an example of particularly disruptive
behavior, Stephen Van Evera (1984) explains the outbreak of WWI as a con-
sequence of the "cult of the offensive" dominating military establishments prior
to 1914 (see also Jervis, 1978; Christensen and Snyder, 1990; Sagan, 1986,
offers a useful review).

*(P3) Defensive alliances increase the likelihood of power politics.* Most realists count alliances as one of the main instruments to maintain system stability. Though Waltz is less convinced by the general stabilizing impact of alliances, he contends that "balancing" rather than "bandwagoning" is likely to produce this result. Elaborating on this theme, in an influential study, Steven Walt (1987) argues that in a "world of balancing" power politics prevails.

## 2. A Non-Technical Overview of the Geopolitical Model

This section briefly describes the main components and rules of the simulation system. The easiest way of introducing the system is to start by displaying a figure depicting the initial state of a territorial system. Figure 3 shows an artificial world consisting of 400 actors arranged in a square grid. The figure illustrates a number of important points that distinguish the geopolitical model from conventional, non-spatial approaches. First, the actors are territorially defined, each of them being surrounded by up to four neighbors. Second, they interact only with their neighbors and have no global knowledge of the system. Third, there are two types of actors, "predator" and "prey," corresponding to status quo and revisionist states, the latter denoted by the shaded areas.

These units' interactions animate the system and drive structural change. In every time period, all territorial neighbors interact. Both the predator and prey states follow a simple rule of reciprocity with the difference that the former sometimes launch unprovoked attacks if they find themselves in a superior position compared to their neighbors. The criterion is called the superiority ratio and governs the defense/offense balance of the system. Since both actor types reciprocate, the result of an attack is always war, costly for both sides
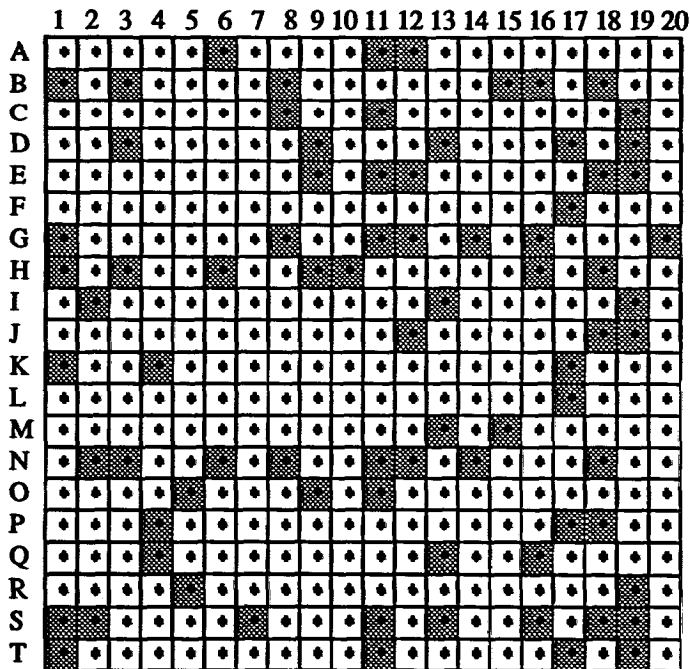


FIG. 3. A 20 x 20 geopolitical system with 20% predator states.

which lose resources. When the logical force balance tips decisively in favor of the stronger party, conquest results, implying that the victor absorbs the targeted unit. This is how hierarchical actors form. If the target already was a part of another multi-province state, this state loses its province. Successful campaigns against the capital of corporate states lead to their collapse.

These rules imply three things: First, the number of states is going to decrease as the predators absorb their victims. Second, as a consequence of conquest, the predatory actors increase in size, their territory expanding into the conquered areas. Third, the surviving units will be predominantly predators, the more peaceful prey states having been eliminated in the selection process.

To illustrate these points, I present the results of a sample run of the 20 x 20 system. Figure 4 plots the number of sovereign states against time. The dynamic process resembles the two phases of contraction and consolidation illustrated in Figure 1. The number of sovereign units decreases dramatically as soon as the predatory process is set in motion. After 50 time periods, system polarity has shrunk to about a tenth of the initial population. After this point, the behavior of the system stabilizes except for some occasional "jumps."

The discontinuities stem from imperial collapses. It is illustrative to investigate the result of the largest of these events. Figure 5 depicts the situation right after the collapse of the empire whose capital was R5 (the code refers to row R and column 5). The small squares in the lower left corner of the figure are the newly independent states. Within the next few time periods, these states will be absorbed by their more powerful neighbors. Except for the temporary fragmentation, the trend is clearly toward a smaller number of large predator states. These hierarchical units are controlled by a capital (marked by a dot) and have emergent outer boundaries as a result of conquest.
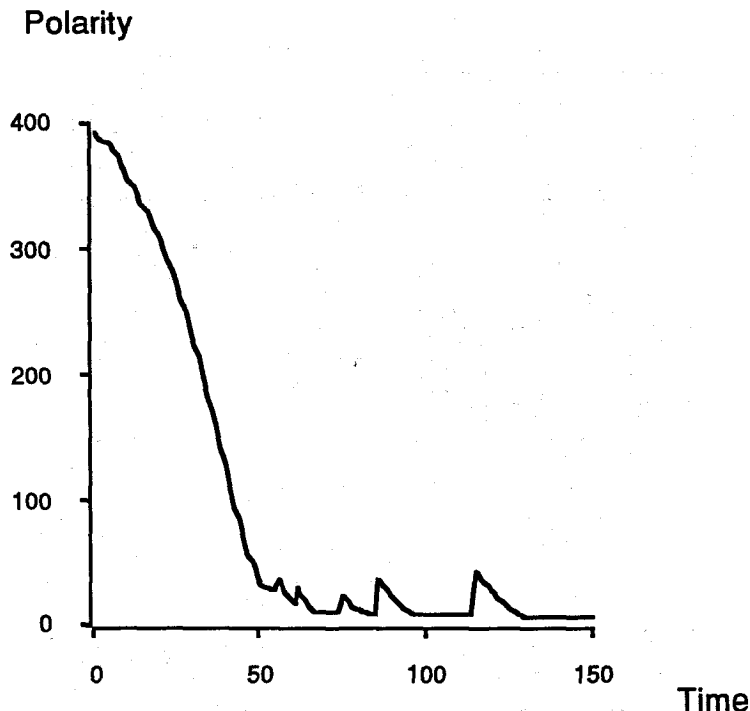


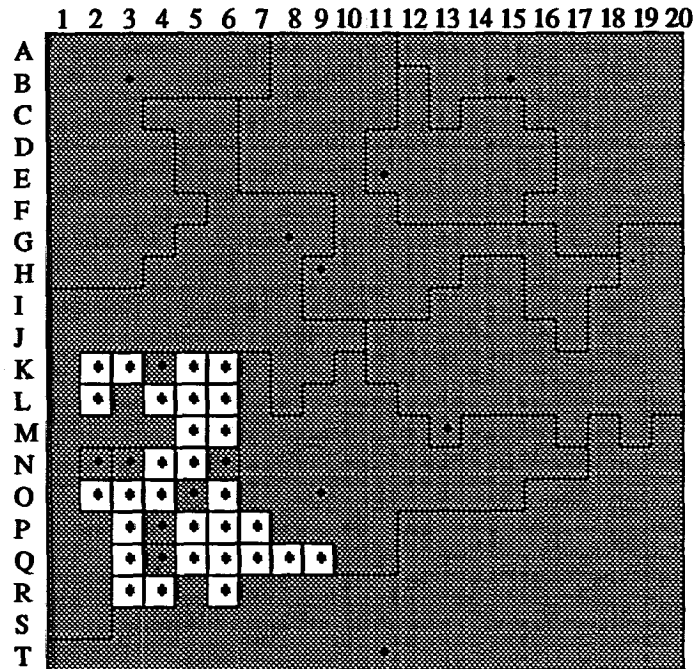FIG. 4. The evolution of the 20 x 20 system.

FIG. 5. The 20 x 20 system in time period 115.

In its most basic form, the model does not include alliances. With the alliance option activated, however, states have the possibility to balance against threats by forming regional, defensive alliances. In this world of balancing, states single out the most threatening state in their proximity. If several states are threatened by the same potential aggressor, an alliance forms against the threatening actor. Alliances enable their members to coordinate collective defense against regional hegemons.

### 3. Technical Specification

Before presenting the results, it is useful to go through the system in greater detail. Readers who are less interested in the technical specification are advised to skip directly to Section 4.

#### Relation to Existing Simulation Models

Unlike conventional rational choice models, the proposed framework incorporates an explicit spatial representation somewhat akin to the "Game of Life" (Gardner, 1970) and cellular automata (e.g., von Neumann, 1966; Burks, 1970; Wolfram, 1986). These methodological tools have only rarely been applied to the social sciences. Thomas Schelling's (1978) suggestive spatial models and Robert Axelrod's (1984) observations about the "structure of cooperation" belong to the exceptions. Yet there is a growing literature focusing on "unorthodox" studies of social systems relying heavily on computer simulation (cf. Arthur, 1991; Holland and Miller, 1991; for reviews see Kreps, 1990; Lane, 1992).

My simulation framework is not the first simulation model to be applied to

realism. In a pioneering contribution, Bremer and Mihalka (1977) developed a geopolitical model to study the consistency of realist thought (see also Dacey, 1974; Schrodt, 1981; Axelrod, 1993). Because of limited computational resources, their analysis did not reach beyond a series of suggestive sample runs. A decade later, Cusack and Stoll (1990) created a closely related, though significantly more efficient, model, and explored its behavior systematically through statistical analysis. More recently, Duffy (1992, 1993) has gone even further in enhancing computational performance by running similar experiments on a parallel machine.

These studies belong to the most promising attempts to go beyond the loose metaphors that dominate traditional realist scholarship. I found Cusack and Stoll's (1990) analysis particularly useful as a conceptual guide. While these models proved instrumental as a source of inspiration, I built up my own system in order to implement three far-reaching technical innovations. First, the original design suggested by Bremer and Mihalka (1977) relies on sequential execution, which singles out pairs of initiator and target states.[4] This solution requires an exogenously defined selection rule that distributes the opportunities for action among the states. Bremer and Mihalka (1977:309), as well as Cusack and Stoll (1990:78–79), programmed their systems to give powerful states proportionally more opportunities to act than weaker actors. While his parallel algorithm allows for the selection of several initiators per round, Duffy (1992:252–253) retains a similar rule of power allocation. My system differs from this design by giving all sovereign states the chance to act simultaneously in every period. The fact that powerful states happen to be those that attack more often is an emergent result rather than a "hard-wired" feature of the model.[5]

Second, Bremer and Mihalka (1977) let interactions proceed as isolated campaigns according to a pre-specified sequence of moves and counter-moves between the initiator and the target. By contrast, the current framework limits the actions to one move per state and time period. Instead, the move sequences may span over several simulation cycles. Behavioral continuity is assured by endowing the actors with a short-term memory rather than forcing them to follow a pre-determined "game tree." This design produces more realistic protracted warfare than the reified campaigns of the Bremer/Mihalka-type models.[6]

Third, I have also simplified the rules of structural change following combat. Since state interactions in the Bremer and Mihalka architecture potentially involve a large number of states, complicated rules to determine war outcomes, including the division of spoils and territorial gains, are needed (1977:316–317; see also Cusack and Stoll, 1990:81–91, and Duffy, 1992:258–259). My decentralized notion of combat solves this problem by having initiators target and attack provinces rather than entire multi-province states. Again, this means that the outcome is an endogenous consequence of the power struggle itself rather than a result of complicated and potentially arbitrary computational rules. As a further advantage, the desired contiguity becomes easier to assure.[7]

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[4]In this context, sequential and parallel execution pertain to the flow of the program and not to the computer architecture.

[5]This truly parallel implementation raises a number of important theoretical questions pertaining to resource allocation and strategic management with respect to multiple fronts, questions that cannot be addressed within a sequential framework. The most important of these is the issue of regional balancing to which we will return below. While outside the scope of the present analysis, it is also possible to treat civil wars as "internal fronts" forcing the central government to allocate resources to maintain internal peace as well.

[6]Duffy's (1993) incorporation of learning and reciprocity is a move in this direction, but he does not change the underlying combat model inherited from the original Bremer and Mihalka model.

[7]The disadvantage of the parallel design is the possibility of computational conflicts. However, it is easy to

In conclusion, I argue that my parallel and incremental design philosophy has several advantages that compensate the loss of compatibility with the Bremer/Mihalka family of models: It leads to conceptual simplification by eliminating several complex algorithms; the behavior of my system exemplifies a higher degree of realism in that the actors' behavior is not limited to fixed-move sequences; the computational performance increases thanks to these simplifications.[8]

### The State System

The system consists of a square grid of user-defined proportions. All the findings presented below were generated in a 10 × 10 system.[9] The basic building blocks are the primitive units, the "social atoms" that constitute the most finely grained picture of social reality that the model can offer. At the start of the simulation, each unit is endowed with resources drawn from a normal distribution. For the purposes of this study, the mean was set to 50 and the standard deviation 10. Once conquest takes place, corporate units form, each consisting of a hierarchy subordinating the conquered units as dependent provinces under the capital. To reduce the complexity of the system, the hierarchical depth of the corporate actors is limited to two levels, the one of the capital and the one of the provinces.[10]

Sovereignty is formalized as a specific authority structure by which the transfer of control from the subordinated units to the heads is both direct and absolute (Coleman, 1990). The assumption of absolute rule implies a pure command structure devoid of any sense of democracy. The sovereignty principle deprives the conquered units of their actor capacity in two respects. The responsibility to manage foreign relations is handed over to the head. Furthermore, internal peace is automatically guaranteed by ruling out revolutions and civil wars as matters of assumption.[11] In essence, this conceptualization of the state comes close to Max Weber's classical definition of a corporate group as "a social relationship which is either closed to outsiders or restricts their admission by regulations, and whose authority is enforced by the actions of specific individuals charged with this function, for example, a chief or head and usually also an administrative staff" (Weber, 1962:107).

### The Dynamic Properties of the System

In its simplest form, the simulation proceeds as a sequence involving three phases (see Fig. 6). First, all sovereign actors make their decisions. Second, the consequences for the resource distribution between the actors are calculated

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circumvent this difficulty by locking the units that have already been modified in the same time period, a common trick in time-sharing operation systems. To make the execution unbiased, the order is randomly determined in every time period. See Duffy (1993:14–15) for a similar solution.

[8]The code was developed in THINK Pascal on a Macintosh and subsequently ported to a Hewlett Packard Unix work station. Despite the serial architecture, the computational performance was sufficient for the purposes of this study. Nevertheless the synchronous algorithms are particularly well suited for future implementation on a parallel machine.

[9]Bremer and Mihalka (1977) and Cusack and Stoll (1990) use a hexagonal map consisting of 98 states. Duffy's (1992:244) rectangular lattice containing 128 actors is closer to the present configuration, although his system is open by allowing the neighbor relations to wrap around the system boundaries.

[10]The limitation to two-level hierarchies excludes explicit consideration of multi-level structures such as feudal and federal systems.

[11]In the civil war extension of the current model, sovereignty emerges gradually. For a theoretical critique of the neorealist sovereignty assumption, see Ashley (1988), Walker (1990, 1993), and Ruggie (1993).
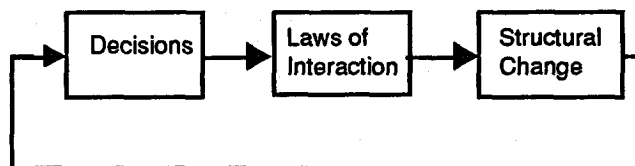
FIG. 6. The basic simulation loop.

according to the rules of interaction. Third, conquest transforms the system's structure.

*1. Decisions.* The synchronous design gives both states in every dyad the choice between cooperate *C* and defect *D*. Since the current model does not include trade or any other peaceful interactions, cooperation stands for little more than refraining from an attack. Only bilateral encounters are considered, so the strategic situation resembles a 2 x 2 game. Presently, there is only one decision rule for the prey and one for the predator states, corresponding to the realist distinction between status quo and revisionist states. The former states adhere to a very simple rule of reciprocity, dubbed Tit For Tat (TFT) (Axelrod, 1984). States employing this rule always respond with the same action the opponent played in the last round and never initiate hostilities.

The predator strategy is somewhat more involved. Like the prey rule, it is also based on TFT. Yet the predator strategy sometimes includes unprovoked aggression. This is done not randomly, but reflecting realist prudence: "The wish to acquire more is admittedly a very natural and common thing; and when men succeed in this they are always praised rather than condemned. But when they lack the ability to do so and yet want to acquire more at all cost, they deserve condemnation for their mistakes" (Machiavelli, 1981:43).

Translated into modeling language, prudence implies two things: first, a predator only considers an unprovoked attack if it is not already involved in warfare on another front. This "Schlieffen plan" rule avoids initiating costly two-front wars that might endanger the survival of the state. Second, revisionist states only attack if the relative power balance between them and their potential victim exceeds a certain ratio, referred to as the superiority ratio.[12] Should there be many potential victims, the aggressor selects the weakest of them.[13]

If the predator decides to strike, a battlefield must be chosen. This is done by randomly selecting a "combat path" consisting of an agent and a target province. If both the attacker and the defender are primitive actors, they also serve as agent and target, respectively. However, if one or both are corporate actors, there may be several possible angles of attack. The current implementation lets the attacker randomly choose any of its provinces (including the capital) that are adjacent to the defending state as the agent. Thereafter, the

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[12]The strategic literature often sets this ratio to 3:1. See Mearsheimer (1983). Surprisingly enough, the Bremer/Mihalka family of models fix this important parameter to one in all simulations. On the other hand, they include a probabilistic criterion that captures misperception in the attacker's power calculus (see especially Cusack and Stoll, 1990:102). Although the system allows for misperception, this study focuses on deterministic power calculations.

[13]This strategy corresponds to Hitler's plan to upset the international equilibrium in the 1930s: "Hitler planned to overturn the tripolar system by initially devouring small and middle powers and then defeating quickly the nearest polar power (the Soviet Union) before the other pole (the U.S.) could intervene . . ." (Schweller, 1993:226). On the other hand, it is easy to find historical examples where the aggressor state turned against more powerful actors first. For example, following the Schlieffen plan, Germany attacked France before striking against the much weaker Russia in WWI. See also Bremer and Mihalka (1977:310) for a similar rule.

attacker selects a target randomly from the provinces of the defending actor that border the agent province.

The decision phase ends by allocating resources for the subsequent interactions. It divides the total resources evenly among all territorial neighbors regardless of local need.[14] For example, a sovereign primitive actor with four neighbors devotes a fourth of its resources to defense against each neighbor. As a corollary, great powers with long borders need more resources to defend themselves than geographically concentrated units. To clarify, Figure 7 summarizes the decision phase of state $i$, with resources $R$, and $n$ neighbors.

In its present form, the system does not support more sophisticated calculations in the game-theoretic sense. The agents' behavior is only forward-looking to the extent that it takes the power ratio between the actors into consideration as a rule of thumb.[15] While some authors view the rational actor assumption as belonging to the core of neorealism (e.g., Keohane, 1983), Waltz (1979:118) claims that his structural theory's evolutionary logic makes it independent of this postulate. Although an extension along these lines would be of general theoretical interest, it does not seem necessary given the purposes of this study.[16]

In complex systems, rational computations are always bounded. As a depiction of long-term and large-scale historical processes, a rational expectations perspective would be grossly misleading. The longer the time scope and the more complex and turbulent the social situation, the less the appeal of a pure rational choice approach and the more of Herbert Simon's (1981) idea of "satisficing." Toulmin (1981) asserts that "given the short-term character of human foresight and calculation in the social realm, it is hard to see how any sort of conscious, deliberate, calculated human decisions could have brought effective social arrangements into existence in the first place" (1981:183; see also Duffy, 1992:242).

Assuming that interaction is confined to conventional land warfare, I limit


```
for each sovereign neighbor j,
     if j played D in the previous period then
          Play D
     else
          Play C. (Tit-for-tat)


if i is a predator and there is no action on any front then
     look for the weakest sovereign neighbor j*
     if R(i)/R(j*) > superiority_ratio then
          Randomly select own agent province and target in j*
          Play D (i.e. launch unprovoked attack against j*)


for each sovereign neighbor j,
     Allocate R(i)/n to front j.
```

FIG. 7. The decision phase.

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[14]This is of course an unrealistic algorithm since real-world states typically reallocate their resources to where the action is. However, it is not hard to modify this implementation of the resource allocation routine. In a revised version of the system, I let the power level be proportional to each opponent's power allocation in the previous period.

[15]These decision rules correspond to Cusack and Stoll's (1990:71) most basic styles of "power management." While the predators resemble their "primitive power-seekers," the prey states follow the altruistic "collective security" strategy, however without alliances which will be added below.

[16]See Cusack and Stoll (1990) for an example of simulations involving "rational" decision makers basing their calculations on expected utility. In future research, I hope to explore the macro consequences of more elaborate decision rules. One idea would be to let strategies be selected akin to Axelrod's (1984) tournaments.

interactions to territorial neighbors. The endogenous nature of the corporate actors entails a similarly variable action scope by which the capital "inherits" as neighbors those of its provinces. This means that great powers may have an almost global action scope. As opposed to the unlimited rationality of game-theoretic models, however, this relative farsightedness is an emergent feature rather than an inherent property of the actors.

*2. Laws of Interaction.* Once all decisions are made, the simulation program executes the decisions for each pair of sovereign actors simultaneously. The interaction process represents the physical laws of war that govern interstate relations. Currently these conditions are fixed, but nothing prevents an endogenization of the parameter settings as a reflection of technological advances. As in a normal 2 x 2 game, there are four possible outcomes: *CC, DC, CD,* and *DD.* Each political interaction generates the resource differences for each pair of actors shown in Figure 8.

The matrix depicts the very simple Richardson-like logic of combat. All the simulations reported here were performed with a destruction rate of $k = 0.05$, which means that the resource level of an actor under attack is reduced by 5% of the locally allocated resources of the attacking state. In opposition to standard game-theoretic models, the laws of war do not offer any immediate advantages to an aggressor other than the relative gain compared to the losses incurred in the other outcomes. Thus they differ from the conventional Prisoner's Dilemma set-up in which attacking states are immediately rewarded if the defender does not respond. Each conflict must end in victory for one party. The outcome is governed by the victory ratio which, unlike the superiority ratio, compares the *locally allocated resources* rather than the balance between the total resources of each side. Should the balance exceed the victory ratio in either direction, the stronger party has won the conflict.[17]

The resource differences produced by wars enter the calculation of each unit's new resource level. In addition to the losses incurred by combat, each actor reaps a "harvest" drawn from a normal distribution with adjustable parameters.

|        | $A_j$  $C$ | $D$ |
|--------|----------|-----|
| $C$    | 0,  0    | $-kR_j$,  0 |
| $D$    | 0, $-kR_i$ | $-kR_j$, $-kR_i$ |

where

$A_i$ = act of state *i*
$R_i$ = local resources of state *i*
$k$  = rate of destruction

FIG. 8. The resource differences resulting from dyadic interaction.

[17]Thanks to the decentralized notion of combat (see below), the present model does not need to feature more complicated probabilistic rules of exchange. The simple ratio rule is non-trivial since combat does not necessarily occur on one front only. Because the territorial gain of conquest only comprises one primitive unit at a time rather than the territory of large states, the absence of a "draw" mechanism does not undermine the possibility of power equilibrium (cf. Cusack and Stoll, 1990:85–91).

In the present study, the mean was 2 and the standard deviation 5. A corporate state receives the sum of the harvests from its capital province and all subordinate members.[18]

*3. Structural Change.* If the resource balance exceeds the victory ratio, the superior party conquers the target province. In the current study, the victory ratio coincided with the superiority ratio. The consequences of conflict vary depending on the nature of the target unit. There are three cases: (1) If it is an independent primitive actor, this unit is subordinated under the head of the conquering state. This case is illustrated by state T11 absorbing R5 in Figure 5. (2) If the target is a province of a corporate actor, the subordinate unit is transferred to the attacker. To illustrate, consider an invasion by B3 of C4. The consequence would be that the disputed province becomes a subject of B3 rather than of G8. Finally, (3) if the target is the capital of a corporate actor, the entire corporate unit collapses into its primitive units when the capital falls. This is in fact what happened to the R5 empire before it fell to T11. The patchwork of small states constitutes the remainder of that empire.[19]

The second case, in which the target is a subordinate province, is interesting because it sometimes gives rise to detached provinces as the vanquished corporate actor loses a part of its territory. This will be the case if there are provinces of this state that can no longer be reached from the capital province as a consequence of the loss of a newly invaded province. In this event, the truncated provinces are made independent to exclude the possibility of enclaves.[20]

When a state loses its sovereignty, it abandons control of its own resources. Upon regaining independence, a province receives an equal share of the resources previously controlled by the center. For example, if a province breaks out of a multi-province state consisting of five subordinated members and a center prior to the secession, it will receive a sixth of the total resources. It also regains its previous strategic orientation.

### Adding Defensive Alliances

Rejecting ideologically motivated alignment patterns, the mainstream realist view suggests that alliances (1) mainly serve to counter external security threats; (2) form as a matter of expediency rather than of principle; (3) are *ad hoc* arrangements rather than long-lasting coalitions—if the threat disappears, so does the alliance (see Holsti, Hopfmann, and Sullivan, 1973, for further references). In a recent study, Steven Walt (1987:21–26) advances his neorealist "balance of threat theory" in which alignments are reactions to security threats pertaining to four factors: aggregate power, geographic proximity, offensive power, and aggressive intentions. To extend Walt's qualitative theory to the dynamic domain, I propose a behavioral notion of threat perception based on

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[18]As in the original Bremer and Mihalka (1977) design, the distribution is common for all states. This excludes the possibility of uneven growth that is sometimes said to generate instability (e.g., Organski, 1968). Yet since this factor lies outside neorealism, there is no need to test it in the present study, but see Cusack and Stoll (1990:91) for a more general implementation.

[19]Unlike the Bremer/Mihalka-type models, the current framework does not feature immediate takeover of large states. Still, it allows the attacking state to absorb some or all of these newly independent units in the near future. However, it has to do so in competition with other states that may also be both motivated and capable to fill parts of the power vacuum.

[20]The requirement of territorial contiguity derives directly from the realist assumption of sovereignty. Needless to say, contiguity and sovereignty were not a part of all historical systems (Ruggie, 1993). The Bremer/Mihalka program also "hard-wires" sovereignty into their models, but since their division of spoils concerns many states and territories at a time, their algorithm is quite involved (cf. Bremer and Mihalka, 1977:316–317; Cusack and Stoll, 1990:88–91; Duffy, 1992:258–259).

the past behavior of expansionist states.[21] This formulation indirectly taps the capability and intentional dimensions of Walt's threat notion because actors that are both powerful and aggressive are likely to be perceived as threatening. Reflecting the analytical focus of Proposition P3, only defensive, decentralized balancing is modeled, excluding the possibility of bandwagoning. Moreover, the purpose is to investigate Walt's ideal "world of balancing," and so alignments should be perfectly binding and credible. Though these two assumptions deviate from the historical record, they represent the theoretically interesting case of an optimal alliance mechanism.[22]

These observations translate into a decentralized notion of alliances as independent actors that coordinate their foreign policy actions without directly redistributing or sharing their resources. Activating the alignment option adds another two additional phases to the main simulation loop (see Fig. 9). Before the decision phase, each state updates the trust score for each neighbor, as a result of the behavioral record of the neighboring states. This score increases gradually in the absence of unprovoked attacks or conquest. Should the latter occur, however, relations deteriorate quickly.[23] Thereafter the actor singles out one of the neighbors as the prime threat. If the state perceives no aggressive behavior, there is no threat.

The second amendment is located as the last step to be executed in each iteration. Here a round of "diplomacy" follows in which every state that perceives a threat announces its willingness to counter the threatening actor. If there is more than one state that feels threatened by a given actor, an alliance automatically forms against that state. By the same token, if there are no longer at least two states that perceive a common threat, the coalition immediately dissolves.[24]

Once in place, alliances influence behavior in two ways, referred to as deterrent and defensive balancing (Cusack and Stoll, 1990:120). First, they have a deterrent function in that they enter the capability calculations of the predator states.
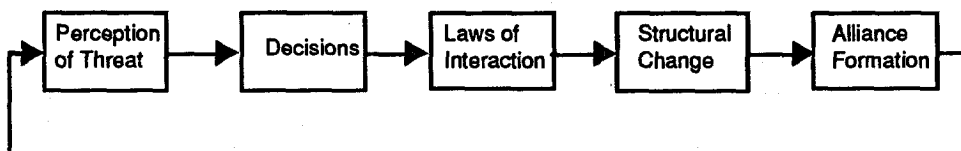


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┌────────────┐   ┌───────────┐   ┌───────────┐   ┌────────────┐   ┌────────────┐
│ Perception │   │           │   │ Laws of   │   │ Structural │   │ Alliance   │
│ of Threat  │──▶│ Decisions │──▶│Interaction│──▶│ Change     │──▶│ Formation  │
└────────────┘   └───────────┘   └───────────┘   └────────────┘   └────────────┘
```

FIG. 9. The extended simulation loop with alliance-formation.

[21] It is important not to confuse the term *threat* in this passive sense with its use to denote a deterrence signal. In formal deterrence theory, the former corresponds to "belief" rather than threat. On the distinction between passive and active uses of the term *threat*, see Cohen (1979:4).

[22] The Bremer/Mihalka framework allows for offensive balancing and endogenously credible alliance commitments. The regional, perfectly credible alliances modeled in my system should not be confounded with Cusack and Stoll's (1990:141–142) "collective security" style of power management. Though automaticity is implied by both strategies, they do not coincide because in my model states might be balancing different threats. A true collective security system presupposes shared threat perceptions. As we will see below, the difference between regional and global balancing can have a decisive impact on system stability.

[23] The choice of parameters for updating the trust indices is necessarily arbitrary. To rely on Bayes' rule, however, would lead to a much too fast and symmetric learning process. Instead, an alternative procedure was adopted by which the trust score $T$ depends on a sensitivity parameter $s$. The latter parameter determines the impact of the change $dT=\pm1000$ on the new trust score: $T(t) = (1-s) T(t-1) + s \, dT$. The value of the sensitivity parameter differs depending on whether $dT$ is negative or positive. In the former case, the perceptual change has a greater impact since negative experiences and threats make themselves felt more quickly than positive ones. Based on observations of the system, I calibrated the sensitivity parameter to $s=0.5$ and $s=0.01$ for negative and positive updating respectively.

[24] This solution differs from Bremer/Mihalka's "one-shot" alliances. In my model, an alliance may persist through several time periods, but only if its members continue to feel threatened by the same aggressor.

If such a state faces a defensive alliance, its decision to launch an unprovoked attack incorporates the sum of resources of the alliance members rather than the capabilities of the chosen victim alone. Should the potential attacker itself belong to an alliance, it can only count on support from the other members if the alliance is targeted against the selected victim.

Second, the attack on an alliance member automatically creates an obligation to support the defending state by coming to its support. This means that each member of the alliance strikes against the aggressor, resulting in a collective defense. If the victim happens to be a member of the aggressor's alliance, the latter state is automatically excluded from the alliance in order to make it impossible for predators to exploit the alliance from within.

## 4. The Impact of Predation and Defense: Hegemonic Takeoff

Unlike real social systems, this type of analysis allows for perfectly controlled experimental conditions. In this first set of runs, I explore the first two propositions by systematically varying the predatory frequency and defense-offense balance. The next section evaluates the third proposition by introducing alliances.

The first independent variable, the predator frequency, determined the number of predator states in the initial system. I ran simulations for the frequencies 0%, 5%, 10%, 20%, 40%, 60%, 80%, and 100%. The second dimension, pertaining to the defense-offense balance, was modeled by setting the superiority ratio to 2 and 3 in what I will refer to as the offense- and defense-dominated systems respectively.

Due to the probabilistic nature of the model, it was necessary to generate a number of replications for each parameter setting. Each parameter configuration was replicated 20 times using different random seeds, thus ensuring that the initial power distributions and the exact location of the predators varied across the replications.[25] All simulations ran until hegemony occurred or 1000 time periods elapsed. Figure 10 displays state survival averaged over the 20 replications.

As can be immediately seen from the steep decrease of both curves, the number of states falls dramatically even for small numbers of predators. This effect is particularly pronounced in the offense-dominated system. A similar, though somewhat less dramatic, phenomenon is visible in the defense-dominated system as well. As would be expected, there is less attrition in the latter world.

Though an interesting statistic, the average rate of state survival does not reveal enough information to evaluate propositions about power politics. Recall that I defined power politics as a process characterized by low polarity short of universal empire. To assess the power of our three realist propositions, it is necessary to study the distribution of polarity among the replications. Figure 11 offers such a disaggregated view of the distributions for the defense-dominated and offense-dominated systems. The diagrams display the emergent polarity of all the 20 replications for each predator frequency. The numbers of replications for each polarity category are stacked one on top of the other. The areas pertain to unipolarity, bipolarity, low multipolarity (from 3 to 10 surviving states), high multipolarity ">10" (from 11 to 90), and virtually no integration ">90" (from

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[25]The replications resemble the use of randomization to eliminate extraneous influences in experimental research (see Campbell and Stanley, 1966). Simulation analysis is essentially an experimental methodology (Kreutzer, 1986).
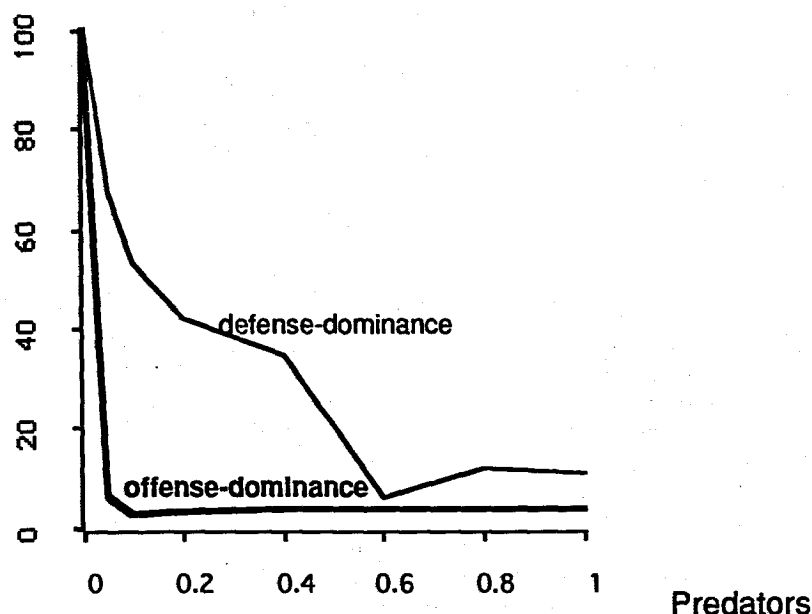
Average Polarity
at time 1000



FIG. 10. Average state survival after 1000 time periods.

91 to 100). For example, in the defense-dominated system at a 60% predator rate, among the 20 replications 5 were unipolar, 9 bipolar, 5 multipolar, and one outcome exceeded 90 states.

To make things concrete, I define power politics as either bipolarity or multipolarity, that is, outcomes featuring from two to ten sovereign states. Given this operational definition, it becomes obvious that power politics completely dominates the outcomes in the offense-dominated system. It is also a common outcome in the defense-dominated world, though only for high predator frequencies. This is an intriguing result. First of all, the structural Proposition P1 seems to possess considerable validity in these runs. Especially in the offense-dominated system, power politics is the structural outcome *regardless of the initial frequency of predators*. However, and all the more surprising, the results contradict the proposition about defense dominance (P2). As anticipated, defensive attitudes tend to increase the chances of state survival, but at the same time the likelihood of unipolarity increases significantly, thus making power politics *less likely in defense-dominated systems.*[26]

Clearly these findings call for an explanation. At this point, it is helpful to

[26]It is hard to compare these findings to Cusack and Stoll (1990) because these authors do not vary the frequency of different actor types continuously. One exception is their Figure 5.6 (p. 156) which displays a roughly linear response to the number of collective security states at the outset, but since states rely on the alignment option, it is not comparable to the system of free competition studied in this section. Moreover, their heavy use of regression analysis makes it hard to recognize non-linear dependencies. Without explicit non-linear terms, regression equations cannot directly capture the non-linear effect of hegemonic takeoff. Finally, because these authors only study a highly offense-dominated system with a fixed superiority ratio of one, their findings say little about Proposition P2.

Number of
replications
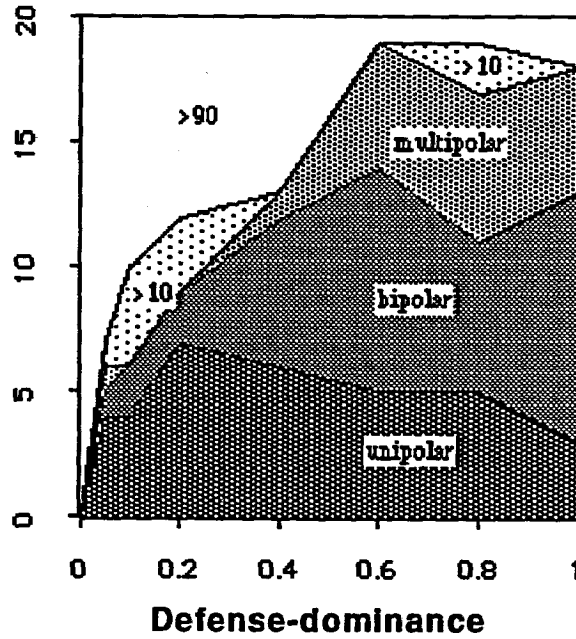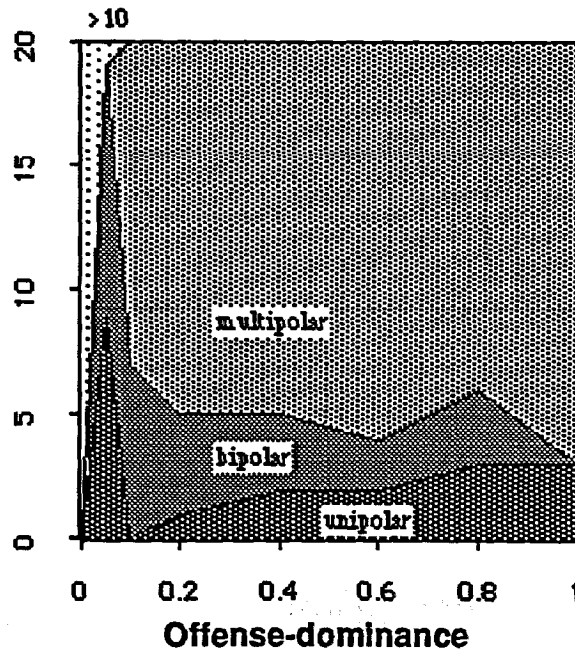


Number of
replications



FIG. 11. Emergent polarity without alliances.

return to Figure 2. In light of our findings, we are now ready to refine this causal scheme. The main problem of this static model relates to the artificial separation of structural causes and consequences. In a dynamic perspective (see Fig. 12), this distinction disappears; today's structural consequence becomes tomorrow's cause. Noting the interdependence between agent and structure, Anthony Giddens (1979) emphasizes the "duality of structure": "Structure thus is not to be conceptualized as a barrier to action, but as essentially involved in its production" (1979:70; see also Wendt, 1987; Dessler, 1989). This realization removes the reification of system structure. In this specific setting, it translates into a negative arrow pointing from integration back to competition. Because system integration implies that the number of states decreases, chances are that some of the absorbed states are going to be predators. But this means that there will be fewer potential competitors, thus further accelerating the process of predation.

The competition/predation/integration triangle constitutes a positive feedback loop because a small disturbance in one of the variables has a tendency to multiply. It is important to note that the positive feedback process works in both directions. A minor decrease in predation, for example, will lead to less integration and more states surviving, including predators. This raises the level of competition, thus curbing the predatory process even further. In the language of systems analysis, such an equilibrium is unstable (Kaplan, 1957).

It is precisely this non-linear effect that makes it legitimate to speak about structural phenomena. If disproportionately small disturbances invariably lead to the same outcome, the structure itself acquires a life of its own. By its nature, the snowball effect is nothing but a positive feedback mechanism. This geopolitical process should not be confused with similar phenomena related to differential growth *within* a country (Kaplan, 1957:31–32; Organski, 1968). The only thing needed to trigger the process is a somewhat uneven *initial* distribution of resources and unbiased stochastic growth rates.[27]
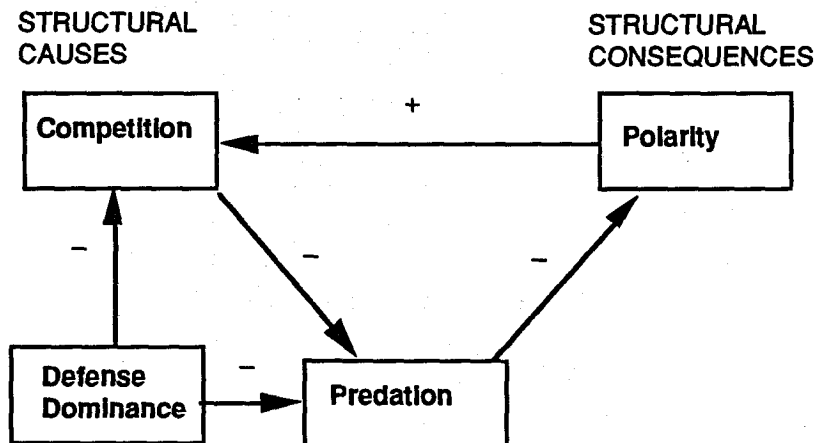


FIG. 12. The dynamic causal model with positive feedback.

[27]Alexander Wendt (1992) refers to a similar, but not identical, predation mechanism. His focus is on strategic adaptation rather than on the selective consequences of conquest (cf. Waltz's 1979 references to socialization and evolution). Like the snowball effect, this is a positive feedback mechanism that explains the occurrence of power politics: "This argument is powerful in part because it is so weak: rather than making the strong assumption that all states are inherently power-seeking (a purely reductionist theory of power politics), it assumes that just one [or a few] is power-seeking and that the others have to follow suit because anarchy permits the one to exploit them" (Wendt, 1992:408).

I label this snowballing process of conquest-induced exponential growth "hegemonic takeoff." In order for power politics to obtain, the hegemonic takeoffs need to be curbed. If the gap between the aspiring hegemon and the second most powerful state increases, the system may easily degenerate into universal empire. Robert Gilpin aptly captures this ecological dynamic:

> The operation of the balance-of-power mechanism is a function of the "density" of an international system. International systems differ with respect to the room or space available for territorial or economic expansion. . . . As states expand, the open frontier shrinks, and they begin to encroach on one another. They increasingly collide, and conflict intensifies among them, raising the costs of further expansion. In time, either one state becomes dominant or a balance is established among states. (Gilpin, 1981:147)

This is why, paradoxically enough, offense-dominated worlds tend to remain pluralistic. The greater the competition, and the more even the growth-rate of the most aggressive states, the more likely balance of power becomes. By contrast, a system that is more defense oriented widens the window of opportunity for potential hegemons by thwarting the attempts of predatory rivals to catch up.

Going back to Figure 11, defense-dominance has two effects: the direct and immediate impact of this variable is to slow down further conquest by making the predators more reluctant to attack. The second and more indirect link influences competition negatively as the defense-orientation of the system increases. Because the arrow from competition to predation is negative, the combined effect becomes positive, thus counteracting the direct defensive mechanism. If the indirect link is stronger than the direct one, the net effect of defense-dominance will be negative, thus removing the obstacles to integration with unipolarity as the most likely outcome.

Although some realists argue that positive feedback is a "myth" (Snyder, 1991), their simultaneous adherence to the security dilemma undermines their position. Thus this type of "defensive realism" contradicts mainstream realism, something that is vividly illustrated by Bremer and Mihalka (1977) who offer an extensive sample of statements by prominent realist scholars. For example, Waltz (1959) makes the following observation about self-help systems: "Because each state is the final judge of its own cause, any state may at any time use force to implement its policies. Because any state may at any time use force, all states must constantly be ready either to counter force with force or to pay the cost of weakness" (p. 159). They further quote Quincy Wright, who nicely captures the logic of the hegemonic takeoff mechanism:

> Governments have a tendency to struggle both for increase of power and for self-preservation. Only if the latter tendency checks the first will all the governments continue to be independent. Whenever one increases its relative power, its capacity to increase it further will be enhanced. As a consequence, any departure from equilibrium tends to initiate an accelerating process of conquest. (Wright, 1965:744)

Whereas these quotations are a bit dated, contemporary realists nevertheless have not changed their minds. Robert Gilpin (1981) contends that "growth of power of a state and its expansion tend to reinforce one another, as expansion increases the economic surplus and resources available to the expanding state" (p. 146).[28] In an even more recent contribution, Peter Liberman makes the same point:

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[28] This quote does not imply that Gilpin believes that economies of scale characterize all historical phases. To be precise, Gilpin posits a U-shaped cost function, suggesting the existence of an optimal organizational scale

> Since conquest pays, according to the realist view, the more you conquer, the
> more wealthy and powerful you become. Rulers have economic and security
> incentives to expand. Status-quo states must rely more heavily on threats of war
> to contain expansionists, and on war itself if threats fail to deter. Unless they
> are contained, imperial rulers will swallow up weaker nations, growing stronger
> and more invincible with each new conquest. (Liberman, 1993:125)

Liberman goes on to provide a useful review of realist scholarship on this point,
including references to prominent realists such as Halford Mackinder, Nicholas
Spykman, and George Kennan.

The current model is entirely consistent with Liberman's postulate that con-
quest pays because the vanquished states delegate *all* their resources to the
conqueror. Whereas the assumption of resource cumulation undoubtedly be-
longs to a dynamic interpretation of realism, its empirical veracity is far from
obvious (see Hopf, 1991, for a historical evaluation). Liberals point out that
both modernization and nationalism tend to counteract this mechanism (see
references in Liberman, 1993).

Although hegemonic takeoffs are rare in the contemporary world, there are
several historical examples of both successful and aborted hegemonic takeoffs.
Studying state-formation in pre-Columbian America, the anthropologist Robert
Carneiro (1970) observed an accelerating centralizing tendency driven by con-
quest (cf. Cusack and Stoll, 1990:47–50). Sweden's remarkable expansion in the
17th century is a more recent case in point. Despite its backward economy and
peripheral position, Sweden succeeded in fielding an enormous army in the
Thirty Years' War. The secret was Gustavus Adolphus's tactic to let war pay for
itself (van Creveld, 1977:9–12) together with the considerable revenue from the
conquered territory in Balticum (Downing, 1992:196).

Another even more momentous example of hegemonic takeoff is Napoleon's
famous campaigns. Though the French victories could be partly attributed to
his tactical genius and the nationalist enthusiasm of his troops, there was clearly
a self-feeding logic at play. Paul Kennedy (1989) quotes Napoleon as saying:
"My power depends on my glory and my glories on the victories I have won.
My power will fail if I do not feed it on new glories and new victories. Conquest
has made me what I am and only conquest enables me to hold my position"
(1989:133). Hitler's bid for Eurasian hegemony also contained important ele-
ments of positive feedback. In great detail, Peter Liberman (1993) shows that
Hitler's Germany succeeded in extracting considerable economic resources from
the occupied countries in addition to the booty, slave labor, and troops acquired
through conquest.

Whether or not the imperialist state can hold on to its conquered territory is
another question. In fact, most hegemonic takeoffs were rather transient affairs:
both Napoleon's Continental System and Hitler's Third Reich crumbled when
a powerful countercoalition formed.[29] This leads us to the role of alliances in
realist theory.

### 5. The Impact of Defensive Alliances: Regional Balancing

Those realists who do not think that internal balancing suffices to guarantee
system stability point to alliances as an extra security mechanism: "The alliance

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beyond which decreasing returns to scale operate (see also Bean, 1973). I thank Jack Snyder for pointing this out
to me.

   [29]The short-lived nature of these disruptions does not reduce their historical importance. Moreover, it would
be wrong to ignore the successful cases of hegemonic takeoff. In fact, state-formation in both England and France
followed a similar centrifugal path, though retrospectively this process is referred to as "internal colonization."

is one of the most prominent means of putting the balance of power theory to work" (Gulick, 1955:61). In its most extreme form, the "pessimistic" line of thought views alliances as a necessary condition of stability (e.g., Carneiro, 1970; see also a review in Cusack and Stoll, 1990). The previous section has already shown that unipolarity is not inevitable even in the absence of alliances. The claim of Proposition P3, however, is more modest. Having ruled out "bandwa-goning" and other offensive uses of alliances (see Levy, 1981; Christensen and Snyder, 1990), it states that defensive alliances increase the likelihood of power politics. Given the counterintuitive results concerning defense-dominance, can we expect decentralized alliances of this type to have a positive impact on system stability?

Figure 13 displays emergent polarity in a world of defensive balancing. A comparison of these results with Figure 11, depicting a system without alliances, yields interesting insights. As expected, the alliance mechanism does offer some protection at least for low predation frequencies. This effect is particularly strong in the defense-dominated system where there is almost no reduction of polarity for predatory rates below 20%. A similar, but weaker, tendency is present in the offense-dominated world. However, contrary to the expectation of P3, de-fensive alliances lead to another important consequence. Compared to the non-aligned world in Figure 11, the present figure shows a remarkable dominance of unipolarity at the expense of power politics. From having been the most common outcome in the offense-dominated system, power politics becomes less likely than universal empire. In the defense-oriented runs, power politics almost does not appear at all except for extremely high predator rates (above 80%).

Thus, in the light of the simulation results, the proposition that defensive alliances increase the likelihood of power politics seems questionable. In analogy with the observations concerning defense-dominance, the reason for this coun-terintuitive phenomenon is to be found in the competitive dynamics of geopol-itics. One way of illustrating the effect is to replace the defense-dominance box in Figure 12 with one labeled "defensive alliances." In addition to the negative, direct impact of defensive alliances on predation, there is a non-trivial ecological influence that disturbs the competitive pressure. The introduction of defensive alliances reduces the level of competition by eliminating, or at least delaying, potential competitors. Without alliances, aggressor states are free to grow, some-thing that leads to a more even timing of the expansionist quests.

By contrast, regional alliances tend to surround threatening states with a defensive pact, thus diminishing the encircled predators' chances to expand. Should one state manage to break out of its confinement, however, it will have more space for conquest because its competitors are prevented from joining the struggle for power. This widens the window of opportunity for the potential hegemon, making it easier for it to reach the threshold of hegemonic takeoff. Having acquired the critical size, the dominant state easily overwhelms whole subsystems of locally stable alliances. At this point, unified defenses could be formed, but as a rule, this is much too late.[30]

Although it has often been observed that collective security tends to distort the operation of the balance of power mechanism (Claude, 1964; see also Cusack and Stoll, 1990:141–142), it has not dawned upon realists that the decentralized, defensive alliances themselves may have a similar disruptive influence. With the exception of Waltz's (1979) reservations about uncertainty and miscalculation in multipolar systems, realists usually consider alliances to be an unproblematic

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[30]The tradeoff between regional and global balancing is absent in the Cusack and Stoll (1990:113, 157) framework, which therefore registers only the direct, negative impact of alliances and collective security arrange-ments on predation.
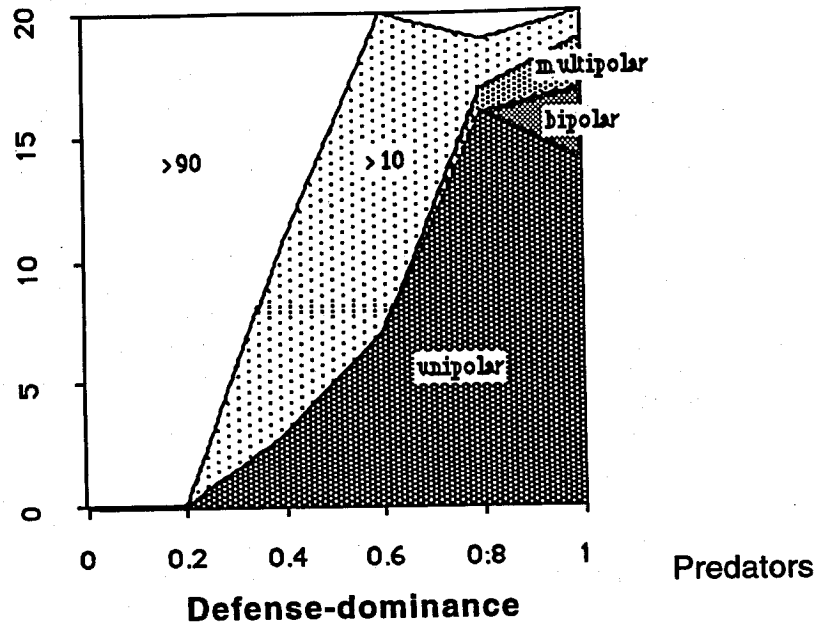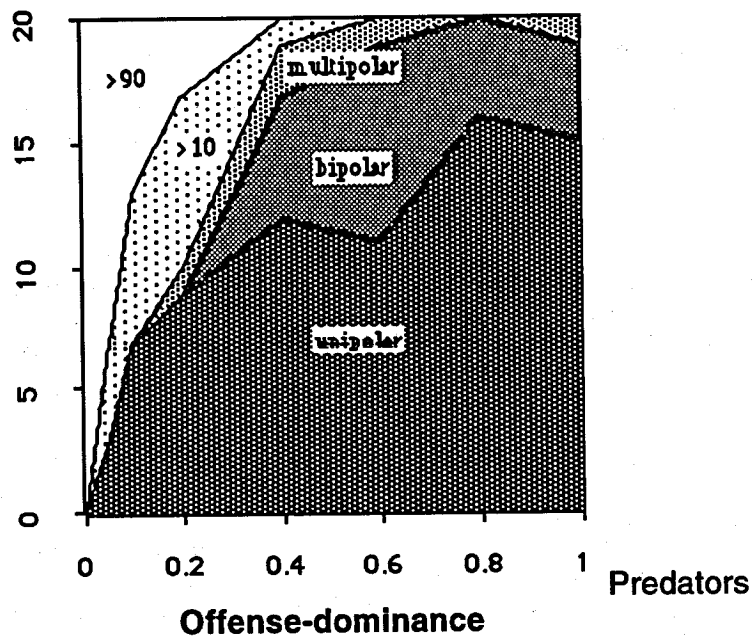
*Emergent Polarity*

**Number of replications**



**Defense-dominance**     Predators

**Number of replications**



**Offense-dominance**     Predators

Fig. 13. Emergent polarity with alliances.

addition to the balancing forces of power politics. To defend their position, some realists suggest that states need to be much more farsighted and concerned by the overall balance of the system (e.g., Kaplan, 1957), but this is clearly not what neorealism is about. According to Waltz's "invisible-hand" imagery, power politics is an unwilled emergent phenomenon rather than a consciously managed process.

Renaissance Italy offers a striking example of how such a regional alignment system indirectly and unintendedly promoted systemic integration on a European-wide scale through foreign intervention. Before the system collapsed, the Italian city-states were entangled in a web of well-poised alignments representing a textbook example of balance of power logic. In his classic study of Renaissance diplomacy, Garreth Mattingly (1955) described the emergence of the balance of power system: "In the 1440s there began to form in certain Italian minds a conception of Italy as a system of independent states, coexisting by virtue of an unstable equilibrium which it was the function of statesmanship to preserve. This conception was fostered by the peninsula-wide alliances whose even balance of forces had ended every war of the past twenty years in stalemate" (1955:83). The equilibrium derived from the stabilizing influence of the defensive alliance formed in response to the hegemonic aspirations of Venice (Guicciardini, 1969:8). As in 19th century Europe, this arrangement brought an astonishing degree of peace and stability. Satisfaction with the performance of Renaissance diplomacy was so great that, one century later, the historian Bernardino Corio looked back at the golden age with a certain nostalgia: "All over there were festivals and delights and Jupiter ruled in peace; everything seemed more stable and firm than it had been at any other time" (cited in Gilbert, 1965:261).

At the end of the 15th century, the external pressure on Italy mounted, but save for some aborted attempts to create an all-Italian defensive alliance, no such common defense emerged. In 1494, this fragile balance ended abruptly with the French siege and subsequent invasion of Naples. This marked the beginning of an era of foreign influence in Italy that would last until the unification of the country in the late 19th century. Why did the Italians fail to form a defensive alliance? In the centuries following the French intervention, this question kept a series of prominent Italian thinkers busy in a fascinating historical debate involving timeless issues of causation and blame (Gilbert, 1965). In their endless search for explanations of the humiliating loss of independence, these historians typically first searched for scapegoats. Soon realizing that the reason for "this astounding instance of political shortsightedness" (Gilbert, 1965:259) lay deeper, the analysts later referred to "luck" as a shorthand for structural causes beyond human control: "The *Fortuna* which emerged as the ruler of world history in the sixteenth century was the power behind everything that happened: it was an embodiment of the uncontrollable forces determining the course of events" (Gilbert, 1965:269). Writing in this century, Mattingly presents a non-teleological, structuralist answer to the puzzle, not far from the theoretical point made in this article: "The State could think only of itself. The natural egotism of a political organization with no higher end than its own self-perpetuation and aggrandizement may come nearer to explaining the diplomacy of the 'concert of Italy' than all the more complex explanations subsequently elaborated" (1955:91).

Although this episode merely illustrates the argument, it has both historical significance and generality. Its importance stems from the momentous consequences of the development of the modern state system. The eclipse of the Italian city-states marked not only a major shift in power from the Mediterranean to the northern states but also the transition from the city-state as a political organization to the state. Its generality is illustrated by Robert Gilpin's obser-

vations about historical shifts of power from the center to the periphery. Draw-
ing on Toynbee and McNeill, Gilpin (1981) attributes this phenomenon to the
diffusion of technology from the core as well as "the power struggle in the
center" (p. 184). He proceeds by elaborating on the latter process:

> The struggle both weakens them and blinds them to the threat of a Macedonia
> or Rome gathering strength and consolidating the land mass over the horizon.
> Failing to unite against the rising peripheral power, they become its victims.
> History is replete with examples of power struggles that exhausted states at the
> center of the system and made them vulnerable to external conquest and dom-
> ination. (Gilpin, 1981:184–185)

This point is also supported by the alliance literature. In his book on small
powers and alliances, Robert Rothstein (1968) observed a tendency toward
encapsulation of regional systems: "The Great Power tends to ally in terms of a
threat to the balance of the whole system; the Small Power in terms of a threat
to its local balance" (p. 62). More recently, Steven Walt (1987) elaborated on
the distinction between global and regional alliances in the context of postwar
diplomacy in the Middle East. Among other factors explaining the trend toward
autonomous alignment patterns on the regional level, he suggests that "because
other regional actors present much more immediate dangers, the regional states
form alliances primarily in response to threats from proximate powers" (p. 164).

Although these authors differentiate between regional and global balancing,
they treat the division between the entire system and its components as prede-
fined. Provided that this relation remains relatively constant, as was often the
case during the Cold War, there is nothing wrong with this assumption. Yet in
periods marked by an increasing blurring of system boundaries, the reified
regional perspective is likely to distort the analysis.

The advantage of the geopolitical model is that it treats both states and
structures, the latter including regional security systems, as *emergent* features
rather than exogenously defined entities. It follows that regional security systems
are fundamentally subjective phenomena rather than arbitrarily defined con-
structs created for purely analytical purposes.[31] This conceptualization comes
very close to Barry Buzan's (1991) "security complexes," each defined as "a
group of states whose primary security concerns link together sufficiently closely
that their national securities cannot realistically be considered apart from one
another" (1991:190).

To return to the example of Renaissance Italy, Italian statesmen regarded
Italy as an isolated system: "There was Italy; and there was the indistinct mass
of all the other nations of Europe which the Italians regarded as culturally
inferior. The Italians of the Renaissance liked to repeat the classical adage that
God—or Nature—had placed the Alps as a protecting wall around Italy" (Gil-
bert, 1965:255). While the model does not include geographic discontinuities
like the Alps, regionalism emerges as a result of the territorial extension of the
system. When a predator is surrounded by a ring of defending states, the latter
corresponds to a regional security system, provided that it is spatially distinct
from other subsystems. Emphasizing the importance of threat perceptions as
the binding "glue," Buzan's definition clearly corresponds to the threat-induced
alliances studied in this article:

> Looked at from the bottom up, security complexes result from interactions
> between individual states. They represent the way in which the sphere of con-
> cern that any state has about its environment, interacts with the linkage between

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[31] For a critique of the arbitrariness of positivist definitions of regional security, see Buzan (1991) and Daase
(1993).

the intensity of military and political threats, and the shortness of the range
over which they are perceived. Because threats operate more potently over short
distances, security interactions with neighbours will tend to have first priority.
(Buzan, 1991:191)

It is the spatial nature of the modeling approach, combined with the emphasis
on bounded rationality of a large number of actors, that allows us to recognize
the perverse effect of defensive alliances. Models without spatial representation,
or those based on hyper-rational assumptions about human decision making,
do not allow for analysis of such ecological patterns.[32]

The fact that there are cases in which leaders have been more successful in
anticipating and controlling challenges to the *status quo* does not necessarily
contradict the assumption of the actors' limited foresight. In periods character-
ized by a small number of great powers, the commitment to regional and global
stability coincide. The "Golden Age" of the European balance of power, so
masterfully described by A. J. P. Taylor (1954), comes to mind.[33] Due to their
small number and wide-ranging spheres of influence compared to the entire
system, the self-interest of the major actors tended to coincide with the goal of
maintaining global stability. Thus, regional balancing automatically acquires a
more global quality as further states are eliminated. The model captures this
effect thanks to the endogenous decision scopes of the actors: the larger the
territory held by a state, the longer the external border and the more numerous
the neighbor relations.

To pick an extreme example, the two objectives necessarily coincide in bipolar
systems. Arguing for bipolarity, Waltz (1979) recognizes this effect: "In a bipolar
world there are no peripheries. With only two powers capable of acting on a
world scale, anything that happens anywhere is potentially of concern to both
of them. Bipolarity extends the geographic scope of both powers' concern" (p.
171). He goes on to link this observation to an argument about uncertainty
being greater in multipolar systems, making war more likely than under bipo-
larity. The geopolitical model produces the same result without making as-
sumptions about uncertainty.

As in the Italian balance of power system, the self-operating logic of the 19th
century alliances ended with a disaster: "The First World War discredited the
laws both of economics and of politics. The self-operating laws had failed to
operate" (Taylor, 1954:xx). This "market failure" put an end to centuries of
European predominance in world politics, and marked the beginning of the
political marginalization of the Old World, culminating with the division of the
continent during the Cold War. Like Italy after the foreign interventions, Eu-
rope became both the prize and the potential battlefield in the new power
struggle (see Dehio, 1962; McNeill, 1963; Buzan, 1991:202–209). It would be
too speculative to attribute this shift of power uniquely to the existence of a
well-functioning alliance system. Other important fragmenting factors inter-
vened, such as the differences in economic growth rates caused by the industrial
revolution and the wave of ethnic nationalism that swept over Europe during
the 19th and early 20th century. Yet, on a counterfactual note, had defensive
alliances not stopped Napoleon and Hitler, Europe might have been more

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[32]The usual objection to the assumption of bounded rationality is that it forces the analyst to impose seemingly
arbitrary limits on the calculative capacity of the actors. The alliance literature lends support to this postulate,
although the restriction of threat perceptions to neighbors does imply a certain arbitrariness. Moreover, although
to assume no limits on the human ability to forecast might appeal to the purism of the rational-expectations
enthusiasts, it appears to be unrealistic, even misleading. The question is not whether or not there are perceptual
limits, but how to model these in time and space.

[33]Not all observers would agree. In a recent article, Rosecrance (1992) asserts that historians have tended to
exaggerate the effectiveness of the balance of power mechanism during this period.

culturally and politically unified than it is today, with important consequences for the global polarity structure.


## 6. Conclusions for Theory and Policy

From a methodological standpoint, the current model fits well into the growing literature on complex social systems spawned by the ambiguity of the post–Cold War era (e.g., Snyder and Jervis, 1993; see also Richardson, 1991, on positive feedback). Instead of elevating theoretical parsimony to the unique goal, these authors emphasize themes such as complexity, non-linear dynamics, feedback loops, and the unintended consequences that result from real-world actors' insufficient capacity to grasp these phenomena. Summarizing this literature, Jack Snyder (1993) contends that "complex systems like the international political system are hard to understand. Many actors, consequently, think about only the direct effects of their behavior, overlooking feedback and indirect effects. Such failures to think in terms of systemic interconnections produce unintended consequences, many of which exacerbate conflict" (1993:5).

As an effort to adapt realist theory to these concerns, this article presents a model that provides a contextually richer and more flexible approach than the standard microeconomic analogies associated with neorealism. This explicitly dynamic and spatial reformulation confirms the neorealist expectation of emerging power politics *provided that the competitive pressure is sufficiently high.* Other refinements of this basic statement were found to be potentially contradictory, at least to the extent that they impair the operation of the "invisible hand." In analogy to protectionist practices and cartels in economic markets, but contrary to the expectation of many realists, both defense-dominance and defensive alliances could undermine the power of the *laissez-faire* interpretation of inter-state relations at least in the long run.

The picture that emerges from the dynamic theory casts doubt on the ambitious, sweeping claims made by many neorealist scholars. Indeed, belief in the "invisible hand" of automatic balancing rests on a number of hidden assumptions that might not be empirically valid or even logically consistent. In particular, the prevalence of power politics depends on an explosive positive feedback mechanism that might lead either to too little integration or to too much for the realist predictions to hold. Because of their focus on a limited number of "great powers," realists need to explain not only how these states emerged against the backcloth of history, but also why this integrative process prevented hegemonic takeoffs.

In the presence of defensive forces emanating from technology, strategic beliefs, or alliance behavior, power politics does not emerge automatically. This seriously weakens the structuralist proposition that power politics prevails regardless of unit-level motivations, since its explanatory power depends on the irrelevance of predator frequencies. Purely defensive alignments on the regional level may undermine the global balance of power even in the absence of "chain-ganging" and "buck-passing" (Christensen and Snyder, 1990). This stability-instability paradox stems from the tendency of states to concentrate on immediate threats to their survival.

The last point has important implications for the current situation in Eastern Europe and the former Soviet Union. The prospects for a successful balance of power regime in this part of the world look particularly bleak: first, the collapse of communist rule opened up the possibility of extremely intense regional conflicts. Second, the alignment situation remains extremely fluid, but potentially conflicting regional security complexes are currently building up. Third, there

are dangerous power asymmetries linked to the enormous difference in size between the smallest republics and Russia proper. Fourth, the region has few norms that guarantee peaceful resolution of conflicts, so predatory incentives and behavior are rampant, as illustrated by Serbia's aggressive policy of conquest. Unfortunately, the unclear political situation in Russia does not exclude the possibility of a regime shift leading to aggressive foreign policy behavior. Although Karl Mueller stresses the potential threat of Germany more than would I, he is right in asserting that

> the salience of intra-regional threats and territorial disputes poses a serious problem. Potential conflicts within the balance which distract its members from balancing against either Russia or Germany in order to deal with smaller but more severe local threats would make an alignment balance impossible to maintain, and such disputes are currently abundant in eastern Europe. The states in an alignment balance do not have to like or even trust each other, but they do need to fear each other less than they fear the great powers, and reaching this point in eastern Europe will require either a substantial degree of regional conflict resolution or an enormous growth in the apparent threat of Russian or German aggression. (Mueller, 1993:40)

If any general policy lesson can be drawn from this reasoning, it's clearly *not* that offensive strategies always promote stability. Quite on the contrary, once a geopolitical system has settled, defense-dominance is likely to stabilize it even further. To the extent that the proponents of "defensive realism" have this more limited policy perspective in mind, their propositions are consistent with the modeling results.[34] The more fluid historical situations under scrutiny in the present study, however, risk degenerating into unipolarity unless the level of competition is high. Given these complications, it is dangerous to place too much trust in the automaticity of the balance of power mechanism. After all, the market analogy is only an analogy, and not necessarily a good one. Notwithstanding the elegance of microeconomic theory, there is no *a priori* reason why the "invisible hand" should be expected to operate outside the realm of economics (especially since it does not always operate inside it).[35] Indeed, the model suggests that the automatic balancing mechanism may be considerably less foolproof than neorealists claim. Apart from the concert concept (Kupchan and Kupchan, 1991), there are considerably less risky and probably more effective alternatives. True, regional security organizations (Ullman, 1991), collective security arrangements (Betts, 1992), and pluralist security communities (Deutsch, et al., 1957) have their drawbacks and constraints, but to argue for a *laissez-faire* perspective in security affairs because neorealist models "can draw on a large and well-tested body of economic theory" (Gilpin, 1981:xi) tends to exaggerate the validity of such models in their own field of application, not to mention their portability to other policy domains.

A more dynamic conception of power politics alerts us against the temptation to reify, or even ignore, regional security arrangements (Buzan, 1991). The exclusive focus on three levels of analysis, corresponding to Waltz's (1959) images on the individual, societal, and systemic levels, obscures the intermediate level between the state and the system. The main reason for this omission is probably related to the mistaken belief that regional interdependencies exclusively derive from cooperative structures such as security regimes (on the latter concept, see Jervis, 1983). Obsessed by the "fact" of anarchy, realists do not

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[34] I thank Jonathan Mercer for clarifying this important distinction.

[35] Traditional economic analysis usually presupposes decreasing returns to scale. Extensions to situations characterized by positive feedback and increasing returns to scale require a dramatically different, more history-dependent approach resembling the current simulation framework (see Arthur 1989, 1990).

believe in any type of international cooperation except for *ad hoc* alliances. Consequently, they fail to understand that relations of enmity can provide as strong a basis for social structure as friendship and trust do (Simmel, 1955; see also Buzan, 1991:218; Daase, 1993:81). To assume, as Mearsheimer (1990) does, that the boundaries of regional security systems can be taken for granted is likely to yield misleading and even dangerous policy conclusions, especially when applied to fluid settings lacking a clearly crystallized regional structure, as in Eastern Europe and the former Soviet republics today.

I am not claiming that the formal framework advanced in this article solves all these conceptual problems. Nevertheless it does provide a set of valuable tools that facilitate analysis of the socio-temporal phenomena. The simulation model should be seen as an artificial geopolitical world that permits us to perform counterfactual thought experiments that would have been impossible to grasp by verbal theorizing.[36] Used in this way, simulation models are much less vulnerable to the almost ritual accusations of arbitrary specification. Such a critique is misplaced since it expects all social science models to serve as predictive tools rather than heuristic devices. What matters here are *not* the exact results produced by the model as much as the heuristic insights and hypotheses that it generates. The latter can be understood independently of the technical implementation of the model (cf. Fig. 11). I have made an effort to convince the reader that they make both theoretical and substantive sense.[37]

In its future, extended form, the framework applies not only to the narrow task of analyzing neorealism; its main purpose is to address long-term political change in general. However, such a broad focus requires relaxing a number of assumptions made for analytical as well as technical reasons. The reification of the state actors' internal structure has to give way to an endogenized approach to sovereignty. A complete explanation of state-formation requires sovereignty to be an emergent result rather than a postulated condition. Such a generalization opens the door for true two-level actions, including civil wars and revolutions causing periodic collapses of empires (Gilpin, 1981; Kennedy, 1989). Most important, unlike the realist conception of states as "peas in a pod" (Claude, 1986), real-world states are differentiated by culture, and in an era of nationalism, this difference matters a lot (e.g., Breuilly, 1982; Mayall, 1990). Despite these limitations, I hope the current study illustrates the potential of explicitly dynamic and ecological modeling for theory development in International Relations.

## References

ARTHUR, W. B. (1989) "Self-Reinforcing Mechanisms in Economics." In *The Economy as an Evolving Complex System*, edited by P. W. Anderson, K. J. Arrow, and D. Pines. Reading, MA: Addison-Wesley.

ARTHUR, W. B. (1990) Positive Feedbacks in the Economy. *Scientific American* 265:92–99.

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[36]Scott Sagan (1986:166) is keenly aware of the need for counterfactual analysis. In his view, Van Evera's (1984) explanation of WWI "has ignored the risks and instabilities that result from purely defensive military strategies." On counterfactuals in the social sciences, see also Elster (1983), Baldwin (1985), and Fearon (1991).

[37]The emphasis on heuristic insights does not exclude the need for more rigorous sensitivity testing. For example, the counterintuitive results pertaining to the influence of defensive alliances may well be reversed under a different specification of the alignment mechanism. It should be remembered that although I randomized some factors such as the initial resource distribution for each replication, many other parameters and rules are "hardwired" into the model. Therefore, the precise results should be interpreted with caution. One way to circumvent this difficulty is to vary a larger number of parameters and to run multiple regressions (cf. Cusack and Stoll, 1990), but to the extent that the functional specification of the regression is linear, this method is likely to miss more complex, non-linear effects.

ARTHUR, W. B. (1991) Learning and Adaptive Economic Behavior. *AEA Papers and Proceedings* 81:353–359.

ASHLEY, R. (1986) "The Poverty of Neorealism." In *Neorealism and Its Critics,* edited by R. O. Keohane, pp. 255–300. New York: Columbia University Press.

ASHLEY, R. (1988) Untying the Sovereign State: A Double Reading of the Anarchy Problematique. *Millennium* 17:227–262.

AXELROD, R. (1984) *The Evolution of Cooperation.* New York: Basic Books.

AXELROD, R. (1993) A Model of the Emergence of New Political Actors. Working Paper 93-11-068. Santa Fe Institute, Santa Fe, New Mexico.

BALDWIN, D. A. (1985) *Economic Statecraft.* Princeton, NJ: Princeton University Press.

BEAN, R. (1973) War and the Birth of the Nation-State. *Journal of Economic History* 33:203–221.

BETTS, R. K. (1992) "Systems for Peace or Causes of War? Collective Security, Arms Control, and the New Europe." In *America's Strategy in a Changing World,* edited by S. M. Lynn-Jones and S. E. Miller, pp. 199–237. Cambridge, MA: MIT Press.

BREMER, S. A., AND M. MIHALKA (1977) "Machiavelli in Machina: Or Politics among Hexagons." In *Problems of World Modeling,* edited by K. W. Deutsch, pp. 303–337. Cambridge, MA: Ballinger.

BREUILLY, J. (1982) *Nationalism and the State.* Chicago: University of Chicago Press.

BURKS, A. W., ED. (1970) *Essays on Cellular Automata.* Champaign-Urbana, IL: University of Illinois Press.

BUZAN, B. (1991) *People, States and Fear: An Agenda for International Security Studies in the Post–Cold War Era.* New York: Harvester Wheatsheaf.

CAMPBELL, D. T., AND J. C. STANLEY (1966) *Experimental and Quasi-Experimental Design for Research.* Chicago: Rand-McNally.

CARNEIRO, R. L. (1970) A Theory of the Origin of the State. *Science* 169:733–738.

CHRISTENSEN, T., AND J. SNYDER (1990) Chain Gangs and Passed Bucks: Predicting Alliance Patterns. *International Organization* 44:137–168.

CLAUDE, I. L. (1964) *Power and International Relations.* New York: Random House.

CLAUDE, I. L. (1986) Myths about the State. *Review of International Studies* 12:1–11.

CLAUDE, I. L. (1989) The Balance of Power Revisited. *Review of International Studies* 15:77–85.

COHEN, R. (1979) *Threat Perception in International Crisis.* Madison, WI: University of Wisconsin Press.

COLEMAN, J. S. (1990) *Foundations of Social Theory.* Cambridge, MA: Harvard University Press.

COX, R. (1986) "Social Forces, States and World Orders: Beyond International Relations Theory." In *Neorealism and Its Critics,* edited by R. O. Keohane, pp. 204–254. New York: Columbia University Press.

CUSACK, T. R., AND R. STOLL (1990) *Exploring Realpolitik: Probing International Relations Theory with Computer Simulation.* Boulder, CO: Lynne Rienner.

DAASE, C. (1993) Regionalisierung der Sicherheitspolitik—Eine Einfürung. In *Regionalisierung der Sicherheitspolitik: Tendenzen in den internationalen Beziehungen nach dem Ost-West-Konflikt,* edited by C. Daase, S. Feske, B. Moltmann, and C. Schmid, pp. 67–87. Baden-Baden: Nomos Verlagsgesellschaft.

DACEY, M. F. (1974) "A Model of Political Integration and Its Use in Reconstruction of a Historical Situation." In *Locational Approaches to Power and Conflict,* edited by K. R. Cox, D. R. Reynolds, and S. Wiley, pp. 213–230. New York: John Wiley & Sons.

DEHIO, L. (1962) *The Precarious Balance.* New York: Alfred A. Knopf.

DESSLER, D. (1989) What's at Stake in the Agent–Structure Debate? *International Organization* 43:441–473.

DEUTSCH, K. W., ET AL. (1957) *Political Community and the North Atlantic Area.* Princeton, NJ: Princeton University Press.

DOWNING, B. M. (1992) *The Military Revolution and Political Change: Origins of Democracy and Autocracy in Early Modern Europe.* Princeton, NJ: Princeton University Press.

DUFFY, G. (1992) Concurrent Interstate Conflict Simulations: Testing the Effects of the Serial Assumption. *Mathematical and Computer Modelling* 16:241–270.

DUFFY, G. (1993) Historical Reflection and the Outcomes of War: A Massively Parallel Computer Simulation. Paper presented at the Annual Meeting of the International Studies Association, Acapulco, Mexico.

ELSTER, J. (1983) *Explaining Technical Change: A Case Study in the Philosophy of Science.* Cambridge: Cambridge University Press.

ELSTER, J. (1985) *Making Sense of Marx.* Cambridge: Cambridge University Press.

FEARON, J. D. (1991) Counterfactual and Hypothesis Testing in Political Science. *World Politics* **43**:169–195.

FERGUSON, Y. H., AND R. W. MANSBACH (1988) *The Elusive Quest: Theory and International Politics.* Columbia, SC: University of South Carolina Press.

FRIEDMAN, M. (1953) *Essays in Positive Economics.* Chicago: Chicago University Press.

GARDNER, M. (1970) The Fantastic Combinations of John Conway's New Solitaire Game "Life." *Scientific American* **223**:120–123.

GIDDENS, A. (1979) *Critical Problems in Social Theory.* Berkeley, CA: University of California Press.

GILBERT, F. (1965) *Machiavelli and Guicciardini: Politics and History in Sixteenth-Century Florence.* Princeton, NJ; Princeton University Press.

GILPIN, R. (1981) *War and Change in World Politics.* Cambridge: Cambridge University Press.

GUICCIARDINI, F. (1969) *The History of Italy,* translated by S. Alexander. Princeton, NJ: Princeton University Press.

GULICK, E. V. (1955) *Europe's Classical Balance of Power: A Case History of the Theory and Practice of Great Concepts of European Statecraft.* New York: W. W. Norton.

HAAS, E. B. (1953) The Balance of Power: Prescription, Concept, or Propaganda. *World Politics* **5**:442–477.

HAYEK, F. A. (1973) *Law, Legislation and Liberty: Rules and Order,* vol. 1. Chicago: Chicago University Press.

HOLLAND, J. H., AND J. H. MILLER (1991) Artificial Adaptive Agents in Economic Theory. *AEA Papers and Proceedings* **81**:365–370.

HOLSTI, O. R., P. T. HOPFMANN, AND J. D. SULLIVAN (1973) *Unity and Disintegration in International Alliances: Comparative Studies.* New York: John Wiley & Sons.

HOPF, T. (1991) Polarity, the Offense–Defense Balance, and War. *American Political Science Review* **85**:475–493.

JERVIS, R. (1978) Cooperation under the Security Dilemma. *World Politics* **30**:167–214.

JERVIS, R. (1983) "Security Regimes." In *International Regimes,* edited by S. D. Krasner, pp. 357–378. Ithaca, NY: Cornell University Press.

KAPLAN, M. A. (1957) *System and Process in International Politics.* New York: John Wiley & Sons.

KENNEDY, P. (1989) *The Rise and Fall of the Great Powers.* New York: Vintage Books.

KEOHANE, R. O. (1983) "Theory of World Politics: Structural Realism and Beyond." In *Political Science: The State of the Discipline,* edited by A. W. Finifter, pp. 503–540. Washington, DC: American Political Science Association.

KRATOCHWIL, F. (1993) The Embarrassment of Change: Neorealism as the Science of Realpolitik without Politics. *Review of International Studies* **19**:63–80.

KREPS, D. M. (1990) *Game Theory and Economic Modelling.* Oxford: Clarendon Press.

KREUTZER, W. (1986) *System Simulation: Programming Styles and Languages.* Reading, MA: Addison-Wesley.

KUPCHAN, C. A., AND C. A. KUPCHAN (1991) "Concerts, Collective Security, and the Future of Europe." In *America's Strategy in a Changing World,* edited by S. M. Lynn-Jones and S. E. Miller, pp. 151–198. Cambridge, MA: MIT Press.

LANE, D. A. (1992) Artificial Worlds and Economics. Working Paper 92-09-048. Santa Fe Institute, Santa Fe, New Mexico.

LEVY, J. S. (1981) Alliance Formation and War Behavior. *Journal of Conflict Resolution* **25**:581–613.

LEVY, J. S. (1989) "The Causes of War: A Review of Theories and Evidence." In *Behavior, Society, and Nuclear War,* edited by P. E. Tetlock et al., pp. 209–333. Oxford: Oxford University Press.

LIBERMAN, P. (1993) The Spoils of Conquest. *International Security* **18**:125–153.

MACHIAVELLI, N. (1981) *The Prince.* London: Penguin Books.

MATTINGLY, G. (1955) *Renaissance Diplomacy.* London: Jonathan Cape.

MAYALL, J. (1990) *Nationalism and International Society.* Cambridge: Cambridge University Press.

McNEILL, W. H. (1963) *The Rise of the West: A History of the Human Community.* Chicago: University of Chicago Press.

MEARSHEIMER, J. J. (1983) *Conventional Deterrence.* Ithaca, NY: Cornell University Press.

MEARSHEIMER, J. J. (1990) Back to the Future: Instability in Europe after the Cold War. *International Security* **15**:5–56.

MUELLER, K. (1993) Patterns of Alliance: Geopolitics and Stability in Eastern Europe. Unpublished manuscript. University of Michigan, Ann Arbor.

NAU, H. R. (1993) Identity and International Politics: An Alternative to Neorealism. Paper presented at the Annual Meeting of the American Political Science Association, Washington, DC.

ORGANSKI, A. F. K. (1968) *World Politics*, 2nd ed. New York: Alfred A. Knopf.

RICHARDSON, G. P. (1991) *Feedback Thought in Social Science and Systems Theory.* Philadelphia: University of Pennsylvania Press.

ROSECRANCE, R. (1992) A New Concert of Powers. *Foreign Affairs* 71:64–82.

ROTHSTEIN, R. L. (1968) *Alliances and Small Powers.* New York: Columbia University Press.

RUGGIE, J. G. (1993) Territoriality and Beyond: Problematizing Modernity in International Relations. *International Organization* 47:139–174.

SAGAN, S. D. (1986) 1914 Revisited. *International Security* 11:151–175.

SCHELLING, T. C. (1978) *Micromotives and Macrobehavior.* New York: W. W. Norton.

SCHRODT, P. A. (1981) Conflict as a Determinant of Territory. *Behavioral Science* 26:37–50.

SCHWELLER, R. L. (1993) "Hitler's Tripolar Strategy for World Conquest." In *Coping with Complexity in the International System*, edited by J. Snyder and R. Jervis, pp. 207–242. Boulder, CO: Westview Press.

SIMMEL, G. (1955) *Conflict and the Web of Group-Affiliations.* New York: Free Press.

SIMON, H. (1981) *The Sciences of the Artificial.* Cambridge, MA: MIT Press.

SNYDER, J. (1984) *The Ideology of the Offensive: Military Decision Making and the Disasters of 1914.* Ithaca, NY: Cornell University Press.

SNYDER, J. (1991) *Myths of Empire: Domestic Politics and International Ambition.* Ithaca, NY: Cornell University Press.

SNYDER, J. (1993) "Introduction: New Thinking about the New International System." In *Coping with Complexity in the International System*, edited by J. Snyder and R. Jervis, pp. 1–24. Boulder, CO: Westview Press.

SNYDER, J., AND R. JERVIS, EDS. (1993) *Coping with Complexity in the International System.* Boulder, CO: Westview Press.

SPRUYT, H. (1991) The Sovereign State and Its Competitors: An Analysis of Systems Change. Ph.D. dissertation. University of California, San Diego, California.

TAYLOR, A. J. P. (1954) *The Struggle for Mastery in Europe: 1848–1918.* Oxford: Oxford University Press.

TILLY, C. (1975) "Reflections on the History of European State-Making." In *The Formation of National States in Western Europe*, edited by C. Tilly, pp. 3–83. Princeton, NJ: Princeton University Press.

TILLY, C. (1985) "War Making and State Making as Organized Crime." In *Bringing the State Back In*, edited by P. B. Evans, D. Rueschemeyer, and T. Skocpol, pp. 169–191. Cambridge: Cambridge University Press.

TILLY, C. (1990) *Coercion, Capital, and European States, AD 990–1990.* Oxford: Basil Blackwell.

TOULMIN, S. E. (1981) "Human Adaptation." In *The Philosophy of Evolution*, edited by U. J. Jensen and R. Harré, pp. 176–195. Brighton, U.K.: Harvester Press.

ULLMAN, R. H. (1991) *Securing Europe.* Twickenham, U.K.: Adamantine Press.

VAN CREVELD, M. (1977) *Supplying War: Logistics from Wallenstein to Patton.* Cambridge: Cambridge University Press.

VAN EVERA, S. (1984) The Cult of the Offensive and the Origins of the First World War. *International Security* 9:58–107.

VON NEUMANN, J. (1966) *Theory of Self-Reproducing Automata.* Urbana, IL: University of Illinois Press.

WALKER, R. B. J. (1990) Security, Sovereignty, and the Challenge of World Politics. *Alternatives* 15:3–27.

WALKER, R. B. J. (1993) *Inside/Outside: International Relations as Political Theory.* Cambridge: Cambridge University Press.

WALT, S. M. (1987) *The Origins of Alliances.* Ithaca, NY: Cornell University Press.

WALTZ, K. N. (1959) *Man, the State and War.* New York: Columbia University Press.

WALTZ, K. N. (1979) *Theory of International Politics.* New York: McGraw-Hill.

WEBER, M. (1962) *Basic Concepts in Sociology.* London: Peter Owen.

WENDT, A. E. (1987) The Agent–Structure Problem in International Relations Theory. *International Organization* 41:335–370.

WENDT, A. E. (1992) Anarchy Is What States Make of It: The Social Construction of Power Politics. *International Organization* 46:391–425.

WOLFRAM, S., ED. (1986) *Theory and Applications of Cellular Automata.* Singapore: World Scientific.

WRIGHT, Q. (1965) *A Study of War.* Chicago: University of Chicago Press.