

Trustees of Princeton University

---

Explaining Cooperation under Anarchy: Hypotheses and Strategies

Author(s): Kenneth A. Oye

Source: *World Politics*, Vol. 38, No. 1 (Oct., 1985), pp. 1-24

Published by: Cambridge University Press

Stable URL: <http://www.jstor.org/stable/2010349>

Accessed: 06-05-2016 12:30 UTC

---

Your use of the JSTOR archive indicates your acceptance of the Terms & Conditions of Use, available at

<http://about.jstor.org/terms>

JSTOR is a not-for-profit service that helps scholars, researchers, and students discover, use, and build upon a wide range of content in a trusted digital archive. We use information technology and tools to increase productivity and facilitate new forms of scholarship. For more information about JSTOR, please contact [support@jstor.org](mailto:support@jstor.org).



*Trustees of Princeton University, Cambridge University Press* are collaborating with JSTOR to digitize, preserve and extend access to *World Politics*

# EXPLAINING COOPERATION UNDER ANARCHY: Hypotheses and Strategies

By KENNETH A. OYE\*

## I. INTRODUCTION

NATIONS dwell in perpetual anarchy, for no central authority imposes limits on the pursuit of sovereign interests. This common condition gives rise to diverse outcomes. Relations among states are marked by war and concert, arms races and arms control, trade wars and tariff truces, financial panics and rescues, competitive devaluation and monetary stabilization. At times, the absence of centralized international authority precludes attainment of common goals. Because as states, they cannot cede ultimate control over their conduct to an supra-national sovereign, they cannot guarantee that they will adhere to their promises. The possibility of a breach of promise can impede cooperation even when cooperation would leave all better off. Yet, at other times, states do realize common goals through cooperation under anarchy. Despite the absence of any ultimate international authority, governments often bind themselves to mutually advantageous courses of action. And, though no international sovereign stands ready to enforce the terms of agreement, states can realize common interests through tacit cooperation, formal bilateral and multilateral negotiation, and the creation of international regimes. The question is: If international relations can approximate both a Hobbesian state of nature and a Lockean civil society, why does cooperation emerge in some cases and not in others?<sup>1</sup>

The contributors to this symposium address both explanatory and prescriptive aspects of this perennial question. *First, what circumstances favor the emergence of cooperation under anarchy?* Given the lack of a

\* I am grateful for comments by Jeff Frieden, Ralph Ginsberg, Joanne Gowa, Stephen Krasner, David Lake, Timothy McKeown, Paul Quirk, Arthur Stein, and the other contributors to this volume.

<sup>1</sup> The essays presented here focus on nation-states as primary actors in world politics, treat national preferences as sovereign, and assume that any ultimate escape from international anarchy is unlikely. Our focus is on non-altruistic cooperation among states dwelling in international anarchy.

central authority to guarantee adherence to agreements, what features of situations encourage or permit states to bind themselves to mutually beneficial courses of action? What features of situations preclude cooperation? *Second, what strategies can states adopt to foster the emergence of cooperation by altering the circumstances they confront?* Governments need not necessarily accept circumstances as given. To what extent are situational impediments to cooperation subject to willful modification? Through what higher order strategies can states create the preconditions for cooperation?

The problem of explaining and promoting international cooperation encompasses many of the principal questions in the disciplines of political economy and security studies. However, divergent terminological conventions and substantive applications have impeded the comparison of answers. In the essays presented here, a unified analytic framework, derived from elementary game theory and microeconomics, has been superimposed on cases in international security and economic affairs. This use of the austere abstractions of game theory and microeconomics offers several advantages.<sup>2</sup> First, superficial differences often obscure the parallelism of questions, explanations, and prescriptions in the two fields. By reducing concepts to fundamentals, the use of elements of game theory and microeconomics permits ready identification of parallels. Second, intrinsic differences between the politics of war and the politics of wealth and welfare may give rise to divergent explanations and prescriptions. A unified analytic framework facilitates explicit recognition of differences in the extent and causes of, and prospects for, cooperation in security and economic affairs. Finally, uneven intellectual development may give rise to divergent explanations and prescriptions. A unified analytic framework fosters transference of useful concepts between the fields.<sup>3</sup>

In this introductory essay, I submit that three circumstantial dimensions serve both as proximate explanations of cooperation and as targets

<sup>2</sup> In this essay, I use elementary game theory in a purely instrumental fashion. First, although some references to the formal literature are provided, the text does not furnish formal proofs on the existence or location of equilibrium points in different categories of games. As Thomas Schelling notes, the equilibrium solutions identified by formal game theorists may stabilize convergent expectations among mathematicians, but unless equilibria can also be reached through "alternative less sophisticated routes," such solutions may have little influence on international outcomes. See Schelling, *The Strategy of Conflict* (London: Oxford University Press, 1963), 113-14. Accordingly, the contributors search for "alternative less sophisticated routes" to reach mutually beneficial equilibrium points and for simple strategies to restructure situations to create mutually beneficial equilibrium points.

<sup>3</sup> For an extended discussion of the uses and abuses of game theory in the empirical study of international politics, see Duncan Snidal, "The Game *Theory* of International Politics," in this collection.

of longer-term strategies to promote cooperation. Each of the three major sections of this piece defines a dimension, explains how that dimension accounts for the incidence of cooperation and conflict in the absence of centralized authority, and examines associated strategies for enhancing the prospects for cooperation.

In the section entitled "Payoff Structure: Mutual and Conflicting Preferences," I discuss how payoffs affect the prospects for cooperation and present strategies to improve the prospects for cooperation by altering payoffs. Orthodox game theorists identify optimal strategies *given* ordinally defined classes of games, and their familiar insights provide the starting point for the discussion.<sup>4</sup> Recent works in security studies, institutional microeconomics, and international political economy suggest strategies to *alter* payoff structures and thereby improve the prospects for cooperation.<sup>5</sup>

In the next section, entitled "Shadow of the Future: Single-play and Iterated Games," I discuss how the prospect of continuing interaction affects the likelihood of cooperation;<sup>6</sup> examine how strategies of reciprocity can provide direct paths to cooperative outcomes under iterated conditions;<sup>7</sup> and suggest strategies to lengthen the shadow of the future.<sup>8</sup> In addition, this section shows that recognition and control capabilities—the ability to distinguish between cooperation and defection by others

<sup>4</sup> For the definitive classification of ordinally defined games, see Anatol Rapoport and Melvin Guyer, "A Taxonomy of 2 x 2 Games," *General Systems* 11 (1966), 203-14. For an extended reinterpretation of crisis bargaining in light of payoff structures, see Glenn H. Snyder and Paul Diesing, *Conflict Among Nations: Bargaining, Decisionmaking, and System Structure in International Crises* (Princeton: Princeton University Press, 1977).

<sup>5</sup> For examples, see Robert Jervis, "Cooperation under the Security Dilemma," *World Politics* 30 (January 1978), 167-214; Oliver E. Williamson, "Credible Commitments: Using Hostages to Support Exchange," *American Economic Review* (September 1983), 519-40; John Gerard Ruggie, "International Regimes, Transactions, and Change: Embedded Liberalism in the Postwar Economic Order," in Stephen D. Krasner, ed., *International Regimes* (Ithaca, N.Y.: Cornell University Press, 1983).

<sup>6</sup> For orthodox game-theoretic analyses of the importance of iteration, see R. Duncan Luce and Howard Raiffa, *Games and Decisions* (New York: Wiley, 1957), Appendix 8, and David M. Kreps, Paul Milgram, John Roberts, and Robert Wilson, "Rational Cooperation in Finitely-Repeated Prisoner's Dilemma," *Journal of Economic Theory* 27 (August 1982), 245-52. For the results of laboratory experiments, see Robert Radlow, "An Experimental Study of Cooperation in the Prisoner's Dilemma Game," *Journal of Conflict Resolution* 9 (June 1965), 221-27. On the importance of indefinite iteration to the emergence of cooperation in business transactions, see Robert Telsor, "A Theory of Self-Enforcing Agreements," *Journal of Business* 53 (January 1980), 27-44.

<sup>7</sup> On how iterated Prisoners' Dilemmas environments literally select for Tit-for-Tat strategies, see Robert Axelrod, *The Evolution of Cooperation* (New York: Basic Books, 1984). For a formal statement on the effects of reciprocity on equilibrium outcomes in iterated games, see Drew Fudenberg and Eric Maskin, "The Folk Theorem in Repeated Games with Discounting and with Incomplete Information," *Econometrica*, forthcoming.

<sup>8</sup> On enhancing iterativeness through decomposition of payoffs over time, see Schelling (fn. 2), 43-46, and Axelrod (fn. 7), 126-32.

and to respond in kind—can affect the power of reciprocity, and suggests strategies to improve recognition capabilities.<sup>9</sup>

In the third section, “Number of Players: Two-Person and N-Person Games,” I explain why cooperation becomes more difficult as the number of actors increases; present strategies for promoting cooperation in N-actor situations; and offer strategies for promoting cooperation by reducing the number of actors necessary to the realization of common interests. Game theorists and oligopoly theorists have long noted that cooperation becomes more difficult as numbers increase, and their insights provide a starting point for discussion.<sup>10</sup> Recent work in political economy focuses on two strategies for promoting cooperation in thorny N-person situations: functionalist analysts of regimes suggest strategies for increasing the likelihood and robustness of cooperation *given* large numbers of actors;<sup>11</sup> analysts of *ad hoc* bargaining in international political economy suggest strategies of bilateral and regional decomposition to *reduce* the number of actors necessary to the realization of some mutual interests, at the expense of the magnitude of gains from cooperation.<sup>12</sup>

Each of the three circumstantial dimensions serves both as an explanation of cooperation and as a target of strategies to promote cooperation. The concluding section of this essay provides a roadmap to our efforts to test these preliminary explanations and strategies. By applying this common analytic framework to cases in economic and security affairs and by searching for explicit parallels and differences in the incidence, causes, and prospects for cooperation, the authors hope to contribute to a deeper understanding of international cooperation.

## II. PAYOFF STRUCTURE: MUTUAL AND CONFLICTING PREFERENCES

The structure of payoffs in a given round of play—the benefits of mutual cooperation (CC) relative to mutual defection (DD) and the benefits of unilateral defection (DC) relative to unrequited cooperation (CD)—is fundamental to the analysis of cooperation. The argument

<sup>9</sup> *Ibid.*, 139–41.

<sup>10</sup> See Martin Shubik, *Games for Society, Business and War: Towards A Theory of Gaming* (New York: Elsevier, 1975). For a formal statement on the importance of the number of players to cooperation in iterated games, see Fudenberg and Maskin (fn. 7).

<sup>11</sup> See Robert O. Keohane, *After Hegemony: Cooperation and Discord in the World Political Economy* (Princeton: Princeton University Press, 1984), and Krasner (fn. 5).

<sup>12</sup> See John A. C. Conybeare, “International Organization and the Theory of Property Rights,” *International Organization* 34 (Summer 1980), 307–34, and Kenneth A. Oye, “Belief Systems, Bargaining, and Breakdown: International Political Economy 1929–1936,” Ph.D. diss. (Harvard University, 1983), chap. 3.

proceeds in three stages. First, how does payoff structure affect the significance of cooperation? More narrowly, when is cooperation, defined in terms of conscious policy coordination, necessary to the realization of mutual interests? Second, how does payoff structure affect the likelihood and robustness of cooperation? Third, through what strategies can states increase the long-term prospects for cooperation by altering payoff structures?

Before turning to these questions, consider briefly some tangible and intangible determinants of payoff structures. The security and political economy literatures examine the effects of military force structure and doctrine, economic ideology, the size of currency reserves, macroeconomic circumstance, and a host of other factors on national assessments of national interests. In "Cooperation under the Security Dilemma," Robert Jervis has explained how the diffusion of offensive military technology and strategies can increase rewards from defection and thereby reduce the prospects for cooperation. In "International Regimes, Transactions, and Chance: Embedded Liberalism in the Postwar Economic Order," John Ruggie has demonstrated how the diffusion of liberal economic ideas increased the perceived benefits of mutual economic openness over mutual closure (CC-DD), and diminished the perceived rewards from asymmetric defection relative to asymmetric cooperation (DC-CD). In "Firms and Tariff Regime Change," Timothy McKeown has shown how downturns in the business cycle alter national tastes for protection and thereby decrease the perceived benefits of mutual openness relative to mutual closure and increase the perceived rewards of asymmetric defection.<sup>13</sup>

In the present symposium, ideological and cognitive determinants of national preferences are emphasized in Stephen Van Evera's essay on the origins of the First World War and Kenneth Oye's chapter on monetary conflict during the 1930s. Robert Jervis's essay on the emergence of concert following systemic wars elucidates international structural determinants of payoffs. John Conybeare's comparative study of trade wars, Kenneth Oye's study of monetary conflict in the 1930s, and Charles Lipson's study of bankers' dilemmas examine macroeconomic determinants of payoff structure. George Downs, David Rocke, and Randolph Siverson investigate domestic structural determinants of payoff structure in their essay on cooperation in arms races. Payoff structure

<sup>13</sup> See Jervis (fn. 5); Ruggie (fn. 5); Timothy J. McKeown, "Firms and Tariff Regime Change: Explaining the Demand for Protection," *World Politics* 36 (January 1984), 215-33. On the effects of *ambiguity* of preferences on the prospects of cooperation, see the concluding sections of Jervis (fn. 5).

serves as an intervening variable between cognitive, domestic, and international structural factors and international cooperation.

#### A. PAYOFF STRUCTURE AND COOPERATION

How does payoff structure determine the significance of cooperation? More narrowly, when is *cooperation*, defined in terms of conscious policy coordination, *necessary* to the realization of *mutual benefits*? For a *mutual benefit* to exist, actors must prefer mutual cooperation (CC) to mutual defection (DD). For coordination to be *necessary* to the realization of the mutual benefit, actors must prefer unilateral defection (DC) to unrequited cooperation (CD). These preference orderings are consistent with the familiar games of Prisoners' Dilemma, Stag Hunt, and Chicken. Indeed, these games have attracted a disproportionate share of scholarly attention precisely because cooperation is desirable but not automatic. In these cases, the capacity of states to cooperate under anarchy, to bind themselves to mutually beneficial courses of action without resort to any ultimate central authority, is vital to the realization of a common good.

Many international situations do not fall within this class of games. First, consider cases in which cooperation will not be necessary to the realization of mutual interests. If actors prefer unrequited cooperation (CD) to unilateral defection (DC), no incentive to cheat exists. The pursuit of self-interest, without regard to the action of others, will automatically lead to mutual gains. For example, pure economic liberals—more common on economics faculties than in trade ministries—believe that unrequited openness is preferable to unilateral protection. Irrespective of the actions of others, a liberal believes that openness is best. In a world of pure liberals, policy coordination will not be necessary to the realization of openness. In such situations, where interests are in full harmony, the capacity of states to cooperate under anarchy is irrelevant to the realization of mutual benefits.<sup>14</sup>

Second, consider cases where no mutual benefit can be realized through cooperation. If at least one actor prefers nominal mutual defection (DD) to nominal mutual cooperation (CC), "policy coordination" cannot lead to mutual gain; the term "cooperation" becomes inapplicable. Symmetric and asymmetric games of Deadlock fall into this category. For example, if both the Soviet Union and the United States prefer arms racing to arms control, conflict is inevitable. Or consider a trade example: a believer in autarky will prefer mutual protection to mutual openness. To speak of cooperation between a pure liberal and a believer in autarky

<sup>14</sup> For an extended discussion of the distinction between cooperation and harmony, see Keohane (fn. 11), 51-55.

is nonsense. Where harmony prevails, cooperation is unnecessary to the realization of mutual interests. Where deadlocks exist, the term “cooperation” is devoid of meaning, and conflict is inevitable. Neither harmony nor deadlock has attracted substantial attention from game theorists—precisely because cooperative and conflictual outcomes follow so directly and simply from the payoff structure.

What function do games of Harmony and Deadlock serve in this collection? In courses on diagnosis, medical students are taught, “When you hear hoofbeats, think horse before you think zebra.” Harrison Wagner has offered similar advice to analysts of international relations.<sup>15</sup> He warned that Stag Hunt, Chicken, and Prisoners’ Dilemma are often inappropriate models of international situations. When you observe conflict, think Deadlock—the absence of mutual interest—before puzzling over why a mutual interest was not realized. When you observe cooperation, think Harmony—the absence of gains from defection—before puzzling over how states were able to transcend the temptations of defection. By devoting substantial attention to the specification of payoff structures, the contributors seek to heed these warnings.

In the class of games—including Prisoners’ Dilemma, Stag Hunt, and Chicken—where cooperation is necessary to the realization of mutual benefits, how does payoff structure affect the likelihood and robustness of cooperation in these situations? Cooperation will be less likely in Prisoners’ Dilemma than in Stag Hunt or Chicken. To understand why, consider each of these games in conjunction with the illustrative stories from which they derive their names.

*Prisoners’ Dilemma*: Two prisoners are suspected of a major crime. The authorities possess evidence to secure conviction on only a minor charge. If neither prisoner squeals, both will draw a light sentence on the minor charge (CC). If one prisoner squeals and the other stonewalls, the rat will go free (DC) and the sucker will draw a very heavy sentence (CD). If both squeal, both will draw a moderate sentence (DD). Each prisoner’s preference ordering is:  $DC > CC > DD > CD$ . If the prisoners expect to “play” only one time, each prisoner will be better off squealing than stonewalling, no matter what his partner chooses to do ( $DC > CC$  and  $DD > CD$ ). The temptation of the rat payoff and fear of the sucker payoff will drive single-play Prisoners’ Dilemmas toward mutual defection. Unfortunately, if both prisoners act on this reasoning, they will draw a moderate sentence on the major charge, while cooperation could have led to a light sentence on the minor charge ( $CC > DD$ ). In single-

<sup>15</sup> Wagner, “The Theory of Games and the Problem of International Cooperation,” *American Political Science Review* 70 (June 1983), 330-46.



play Prisoners' Dilemmas, individually rational actions produce a collectively suboptimal outcome.

*Stag Hunt*: A group of hunters surround a stag. If all cooperate to trap the stag, all will eat well (CC). If one person defects to chase a passing rabbit, the stag will escape. The defector will eat lightly (DC) and none of the others will eat at all (CD). If all chase rabbits, all will have some chance of catching a rabbit and eating lightly (DD). Each hunter's preference ordering is:  $CC > DC > DD > CD$ . The mutual interest in plentiful venison (CC) relative to all other outcomes militates strongly against defection. However, because a rabbit in the hand (DC) is better than a stag in the bush (CD), cooperation will be assured only if each hunter believes that all hunters will cooperate. In single-play Stag Hunt, the temptation to defect to protect against the defection of others is balanced by the strong universal preference for stag over rabbit.<sup>16</sup>

*Chicken*: Two drivers race down the center of a road from opposite directions. If one swerves and the other does not, then the first will suffer the stigma of being known as a chicken (CD) while the second will enjoy being known as a hero (DC). If neither swerves, both will suffer grievously in the ensuing collision (DD). If both swerve, damage to the reputation of each will be limited (CC). Each driver's preference ordering is:  $DC > CC > CD > DD$ . If each believes that the other will swerve, then each will be tempted to defect by continuing down the center of the road. Better to be a live hero than a live chicken. If both succumb to this temptation, however, defection will result in collision. The fear that the other driver may not swerve decreases the appeal of continuing down the center of the road. In single-play Chicken, the temptations of unilateral defection are balanced by fear of mutual defection.<sup>17</sup>

In games that are not repeated, only ordinally defined preferences matter. Under single-play conditions, interval-level payoffs in ordinally defined categories of games cannot (in theory) affect the likelihood of cooperation. In the illustrations above, discussions of dominant strategies

<sup>16</sup> Kenneth Waltz borrowed Rousseau's parable of the stag hunt to illustrate the infeasibility of realizing mutual interests under international anarchy. Rousseau used the stag hunt to illustrate the possibility of cooperation during his first period of primitive social interdependence. He argued that individuals could cooperate on "mutual undertakings" to realize "present and perceptible interest" through "some kind of free association that obligated no one and lasted only so long as the passing need that formed it." This essay returns to Rousseau's use of the stag hunt. See Waltz, *Man, the State, and War* (New York: Columbia University Press, 1959), and *Jean Jacques Rousseau: The First and Second Discourses*, trans. Roger D. and Judith R. Masters (New York: St. Martins, 1964), 165-67.

<sup>17</sup> The illustrative preference orderings strike most mature observers as perverse: the drivers need not place themselves in the game.

do not hinge on the magnitude of differences among the payoffs. Yet the magnitude of differences between CC and DD and between DC and CD can be large or small, if not precisely measurable, and can increase or decrease. Changes in the magnitude of differences in the value placed on outcomes can influence the prospects for cooperation through two paths.

First, changes in the value attached to outcomes can transform situations from one ordinally defined class of game into another. For example, in "Cooperation under the Security Dilemma" Robert Jervis described how difficult Prisoners' Dilemmas may evolve into less challenging Stag Hunts if the gains from mutual cooperation (CC) increase relative to the gains from exploitation (DC). He related the structure of payoffs to traditional concepts of offensive and defensive dominance, and offensive and defensive dominance to technological and doctrinal shifts. Ernst Haas, Mary Pat Williams, and Don Babai have emphasized the importance of cognitive congruence as a determinant of technological cooperation. The diffusion of common conceptions of the nature and effects of technology enhanced perceived gains from cooperation and diminished perceived gains from defection, and may have transformed some Prisoners' Dilemmas into Harmony.<sup>18</sup>

Second, under iterated conditions, the magnitude of differences among payoffs *within* a given class of games can be an important determinant of cooperation. The more substantial the gains from mutual cooperation (CC-DD) and the less substantial the gains from unilateral defection (DC-CD), the greater the likelihood of cooperation. In iterated situations, the magnitude of the difference between CC and DD and between DC and CD in present and future rounds of play affects the likelihood of cooperation in the present. This point is developed at length in the section on the shadow of the future.

#### B. STRATEGIES TO ALTER PAYOFF STRUCTURE

If payoff structure affects the likelihood of cooperation, to what extent can states alter situations by modifying payoff structures, and thereby increase the long-term likelihood of cooperation? Many of the tangible and intangible determinants of payoff structure, discussed at the outset of this section, are subject to willful modification through unilateral, bilateral, and multilateral strategies. In "Cooperation under the Security Dilemma," Robert Jervis has offered specific suggestions for altering payoff structures through unilateral strategies. Procurement policy can

<sup>18</sup> Haas, Williams, and Babai, *Scientists and World Order: The Uses of Technical Knowledge in International Organizations* (Berkeley: University of California Press, 1977).

affect the prospects for cooperation. If one superpower favors procurement of defensive over offensive weapons, it can reduce its own gains from exploitation through surprise attack (DC) and reduce its adversary's fear of exploitation (CD). Members of alliances have often resorted to the device of deploying troops on troubled frontiers to increase the likelihood of cooperation. A state's use of troops as hostages is designed to diminish the payoff from its own defection—to reduce its gains from exploitation (DC)—and thereby render defensive defection by its partner less likely. Publicizing an agreement diminishes payoffs associated with defection from the agreement, and thereby lessens gains from exploitation. These observations in international relations are paralleled by recent developments in microeconomics. Oliver Williamson has identified unilateral and bilateral techniques used by firms to facilitate interfirm cooperation by diminishing gains from exploitation. He distinguishes between specific and nonspecific costs associated with adherence to agreements. Specific costs, such as specialized training, machine tools, and construction, cannot be recovered in the event of the breakdown of an agreement. When parties to an agreement incur high specific costs, repudiation of commitments will entail substantial losses. Firms can thus reduce their gains from exploitation through the technique of acquiring dedicated assets that serve as hostages to continuing cooperation. Nonspecific assets, such as general-purpose trucks and airplanes, are salvageable if agreements break down; firms can reduce their fear of being exploited by maximizing the use of nonspecific assets, but such assets cannot diminish gains from exploitation by serving as hostages.<sup>19</sup> Unilateral strategies can improve the prospects of cooperation by reducing both the costs of being exploited (CD) and the gains from exploitation (DC). The new literature on interfirm cooperation indirectly raises an old question on the costs of unilateral strategies to promote cooperation in international relations.

In many instances, unilateral actions that limit one's gains from exploitation may have the effect of increasing one's vulnerability to exploitation by others. For example, a state could limit gains from defection from liberal international economic norms by permitting the expansion of sectors of comparative advantage and by permitting liquidation of inefficient sectors. Because a specialized economy is a hostage to international economic cooperation, this strategy would unquestionably increase the credibility of the nation's commitment to liberalism. It also

<sup>19</sup> Williamson (fn. 5).

has the effect, however, of increasing the nation's vulnerability to protection by others. In the troops-as-hostage example, the government that stations troops may promote cooperation by diminishing an ally's fear of abandonment, but in so doing it raises its own fears of exploitation by the ally. In an example from the neoconservative nuclear literature, Paul Nitze, Colin Gray, William Van Cleave, and others assume that missiles will be fired against missiles rather than against industries or cities, and conclude that a shift from counterforce toward countervalue weapons may purchase a reduction in gains from exploitation at the expense of heightened vulnerability to exploitation.<sup>20</sup> Cognitive, domestic, and international structural factors affect payoff structure directly, and also influence perceptions of the benefits and limits of unilateral strategies to alter payoffs.

Unilateral strategies do not exhaust the range of options that states may use to alter payoff structures. Bilateral strategies—most significantly strategies of issue linkage—can be used to alter payoff structures by combining dissimilar games. Because resort to issue linkage generally assumes iteration, analysis of how issue linkage can be used to alter payoffs is presented in the section on the shadow of the future. Furthermore, bilateral “instructional” strategies can aim at altering another country's understanding of cause-and-effect relationships, and result in altered perceptions of interest. For example, American negotiators in SALT I sought to instruct their Soviet counterparts on the logic of mutual assured destruction.<sup>21</sup>

Multilateral strategies, centering on the formation of international regimes, can be used to alter payoff structures in two ways. First, norms generated by regimes may be internalized by states, and thereby alter payoff structure. Second, information generated by regimes may alter states' understanding of their interests. As Ernst Haas argues, new regimes may gather and distribute information that can highlight cause-and-effect relationships not previously understood. Changing perceptions of means-ends hierarchies can, in turn, result in changing perceptions of interest.<sup>22</sup>

<sup>20</sup> See Paul Nitze, “Assuring Strategic Stability in an Era of Detente,” *Foreign Affairs* 54 (January 1976), 207–32, for the seminal article in this tradition. Nitze's recommendations hinge on acceptance of the precepts of what has come to be known as nuclear utilization theory. Jervis's recommendations depend on acceptance of the precepts of mutual assured destruction (fn. 5).

<sup>21</sup> See John Newhouse, *Cold Dawn: The Story of SALT I* (New York: Holt, Rinehart & Winston, 1973).

<sup>22</sup> See Haas, “Words Can Hurt You; Or Who Said What to Whom About Regimes,” in Krasner (fn. 5).

### III. THE SHADOW OF THE FUTURE: SINGLE-PLAY AND ITERATED GAMES

The distinction between cases in which similar transactions among parties are unlikely to be repeated and cases in which the expectation of future interaction can influence decisions in the present is fundamental to the emergence of cooperation among egotists. As the previous section suggests, states confronting strategic situations that resemble single-play Prisoners' Dilemma and, to a lesser extent, single-play Stag Hunt and Chicken, are constantly tempted by immediate gains from unilateral defection, and fearful of immediate losses from unrequited cooperation. How does continuing interaction affect prospects for cooperation? The argument proceeds in four stages. First, why do iterated conditions improve the prospects for cooperation in Prisoners' Dilemma and Stag Hunt while diminishing the prospects for cooperation in Chicken? Second, how do strategies of reciprocity improve the prospects for cooperation under iterated conditions? Third, why does the effectiveness of reciprocity hinge on conditions of play—the ability of actors to distinguish reliably between cooperation and defection by others and to respond in kind? Fourth, through what strategies can states improve conditions of play and lengthen the shadow of the future?<sup>23</sup>

Before turning to these questions, consider the attributes of iterated situations. First, states must expect to continue dealing with each other. This condition is, in practice, not particularly restrictive. With the possible exception of global thermonuclear war, international politics is characterized by the expectation of future interaction. Second, payoff structures must not change substantially over time. In other words, each round of play should not alter the structure of the game in the future. This condition is, in practice, quite restrictive. For example, states considering surprise attack when offense is dominant are in a situation that has many of the characteristics of a single-play game: attack alters options and payoffs in future rounds of interaction. Conversely, nations considering increases or decreases in their military budgets are in a situation that has many of the characteristics of an iterated game: spending options and associated marginal increases or decreases in military strength are likely to remain fairly stable over future rounds of interaction. In international monetary affairs, governments considering or fearing devaluation under a gold-exchange standard are in a situation that has many of the characteristics of a single-play game: devaluation may diminish the value of another state's foreign currency reserves on a one-

<sup>23</sup> This section is derived largely from Axelrod (fn. 7), and Telsor (fn. 6).

time basis, while reductions in holdings of reserves would diminish possible losses on a one-time basis. Conversely, governments considering intervention under a floating system with minimal reserves are in a situation that has many of the characteristics of an iterated game: depreciation or appreciation of a currency would not produce substantial one-time losses or gains. Third, the size of the discount rate applied to the future affects the iterativeness of games. If a government places little value on future payoffs, its situation has many of the characteristics of a single-play game. If it places a high value on future payoffs, its situation may have many of the characteristics of an iterated game. For example, political leaders in their final term are likely to discount the future more substantially than political leaders running for, or certain of, reelection.

#### A. THE SHADOW OF THE FUTURE AND COOPERATION

How does the shadow of the future affect the likelihood of cooperation? Under single-play conditions without a sovereign, adherence to agreements is often irrational. Consider the single-play Prisoners' Dilemma. Each prisoner is better off squealing, whether or not his partner decides to squeal. In the absence of continuing interaction, defection would emerge as the dominant strategy. Because the prisoners can neither turn to a central authority for enforcement of an agreement to cooperate nor rely on the anticipation of retaliation to deter present defection, cooperation will be unlikely under single-play conditions. If the prisoners expect to be placed in similar situations in the future, the prospects for cooperation improve. Experimental evidence suggests that under iterated Prisoners' Dilemma the incidence of cooperation rises substantially.<sup>24</sup> Even in the absence of centralized authority, tacit agreements to cooperate through mutual stonewalling are frequently reached and maintained. Under iterated Prisoners' Dilemma, a potential defector compares the immediate gain from squealing with the possible sacrifice of future gains that may result from squealing.<sup>25</sup> In single-play Stag

<sup>24</sup> See Anatol Rapoport and Albert Chammah, *Prisoner's Dilemma* (Ann Arbor: University of Michigan Press, 1965), and subsequent essays in *Journal of Conflict Resolution*.

<sup>25</sup> One common objection to this line of argument centers on the irrationality of cooperation if a sequence of Prisoners' Dilemmas has a known last element. On the known last play, the immediate gain from squealing cannot be offset by expectations of future cooperation. On the next-to-last play, the immediate gain from squealing is not offset by expectations of future cooperation, since both actors know that cooperation is irrational on the last move. And so on back toward the initial move. This line of analysis collapses iterated Prisoners' Dilemma into single-play Prisoners' Dilemma. To analysts of international relations, the importance of this objection is limited. In international relations, no experimenter decrees that a series of Prisoners' Dilemmas shall end on the 10th move or at noon. Although any series of transactions will terminate sooner or later, governments do not generally know when the last play will occur. On all rounds of play, the actors' decisions are conditioned

Hunt, each hunter is tempted to defect in order to defend himself against the possibility of defection by others. A reputation for reliability, for resisting temptation, reduces the likelihood of defection. If the hunters are a permanent group, and expect to hunt together again, the immediate gains from unilateral defection relative to unrequited cooperation must be balanced against the cost of diminished cooperation in the future. In both Prisoners' Dilemma and Stag Hunt, defection in the present *decreases* the likelihood of cooperation in the future. In both, therefore, iteration improves the prospects for cooperation.<sup>26</sup> In Chicken, iteration may decrease the prospects for cooperation. Under single-play conditions, the temptation of unilateral defection is balanced by the fear of the collision that follows from mutual defection. How does iteration affect this balance? If the game is repeated indefinitely, then each driver may refrain from swerving in the present to coerce the other driver into swerving in the future. Each driver may seek to acquire a reputation for not swerving to cause the other driver to swerve. In iterated Chicken, one driver's defection in the present may decrease the likelihood of the other driver's defection in the future.<sup>27</sup>

#### B. STRATEGIES OF RECIPROCITY AND CONDITIONS OF PLAY

It is at this juncture that strategy enters the explanation. Although the expectation of continuing interaction has varying effects on the likelihood of cooperation in the illustrations above, an iterated environment permits resort to strategies of reciprocity that may improve the prospects of cooperation in Chicken as well as in Prisoners' Dilemma and Stag Hunt. Robert Axelrod argues that strategies of reciprocity have the effect of promoting cooperation by establishing a direct connection between an actor's present behavior and anticipated future benefits. Tit-for-Tat, or conditional cooperation, can increase the likelihood of joint cooperation by shaping the future consequences of present cooperation or defection.

---

by the possibility of future interaction. For a formal analysis of how uncertain time horizons can lead to a resolution of the Prisoners' Dilemma, see Luce and Raiffa (fn. 6), Appendix 8. Discount parameters such as Axelrod's " $w$ " may capture the effects of uncertainty. Possible future payoffs may be discounted both because the value placed on future benefits is lower than present benefits and because the stream of future benefits may be interrupted if the structure of the game changes.

<sup>26</sup> This conclusion rests on the assumption that dyadic interactions are moderately independent. For an argument on how defection can provide a benefit (external to a dyadic interaction) by discouraging the entry of other actors, see Shibley Telhami, "Cooperation or Coercion: Tit for Tat and the Realities of International Politics," unpub. (Swarthmore College, January 1985). Note also that cooperation can also encourage (mutually beneficial) entry of other actors.

<sup>27</sup> On iterated Chicken, see Snyder and Diesing (fn. 4), 43-44.

In iterated Prisoners' Dilemma and Stag Hunt, reciprocity underscores the future consequences of present cooperation and defection. The argument presented above—that iteration enhances the prospects for cooperation in these games—rests on the assumption that defection in the present will decrease the likelihood of cooperation in the future. Adoption of an implicit or explicit strategy of matching stonewalling with stonewalling, squealing with squealing, rabbit chasing with rabbit chasing, and cooperative hunting with cooperative hunting validates the assumption. In iterated Chicken, a strategy of reciprocity can offset the perverse effects of reputational considerations on the prospects for cooperation. Recall that in iterated Chicken, each driver may refrain from swerving in the present to coerce the other driver into swerving in the future. Adoption of an implicit or explicit strategy of Tit-for-Tat in iterated games of Chicken alters the future stream of benefits associated with present defection. If a strategy of reciprocity is credible, then the mutual losses associated with future collisions can encourage present swerving. In all three games, a promise to respond to present cooperation with future cooperation and a threat to respond to present defection with future defection can improve the prospects for cooperation.

The effectiveness of strategies of reciprocity hinges on conditions of play—the ability of actors to distinguish reliably between cooperation and defection by others and to respond in kind. In the illustrations provided above, the meaning of “defect” and “cooperate” is unambiguous. Dichotomous choices—between squeal and stonewall, chase the rabbit or capture the stag, continue down the road or swerve—limit the likelihood of misperception. Further, the actions of all are transparent. Given the definitions of the situations, prisoners, hunters, and drivers can reliably detect defection and cooperation by other actors. Finally, the definition of the actors eliminates the possibility of control problems. Unitary prisoners, hunters, and drivers do not suffer from factional, organizational, or bureaucratic dysfunctions that might hinder implementation of strategies of reciprocity.

In international relations, conditions of play can limit the effectiveness of reciprocity. The definition of cooperation and defection may be ambiguous. For example, the Soviet Union and the United States hold to markedly different definitions of “defection” from the terms of détente as presented in the Basic Principles Agreement;<sup>28</sup> the European Community and the United States differ over whether domestic sectoral policies comprise indirect export subsidies. Further, actions may not be

<sup>28</sup> See Alexander L. George, *Managing U.S.-Soviet Rivalry: Problems of Crisis Prevention* (Boulder, CO: Westview, 1983).



transparent. For example, governments may not be able to detect one another's violations of arms control agreements or indirect export subsidies. If defection cannot be reliably detected, the effect of present cooperation on possible future reprisals will erode. Together, ambiguous definitions and a lack of transparency can limit the ability of states to recognize cooperation and defection by others.

Because reciprocity requires flexibility, control is as important as recognition. Internal factional, organizational, and bureaucratic dysfunctions may limit the ability of nations to implement Tit-for-Tat strategies. It may be easier to sell one unvarying line of policy than to sell a strategy of shifting between lines of policy in response to the actions of others. For example, arms suppliers and defense planners tend to resist the cancellation of weapons systems even if the cancellation is a response to the actions of a rival. Import-competing industries tend to resist the removal of barriers to imports, even if trade liberalization is in response to liberalization by another state. At times, national decision makers may be unable to implement strategies of reciprocity. On other occasions, they must invest heavily in selling reciprocity. For these reasons, national decision makers may display a bias against conditional strategies: the domestic costs of pursuing such strategies may partially offset the value of the discounted stream of future benefits that conditional policies are expected to yield.

As Robert Axelrod notes, problems of recognition and control may limit effective resort to reciprocity. In this symposium, such problems are examined in several ways. The essay on "Arms Races and Cooperation" presents a simple simulation designed to assess the sensitivity of Tit-for-Tat strategies to departures from perfect recognition and control. The case studies and the conclusion assess the extent to which problems of recognition and control are, in practice, impediments to effective utilization of strategies of reciprocity.<sup>29</sup>

#### C. STRATEGIES TO IMPROVE RECOGNITION AND LENGTHEN THE SHADOW OF THE FUTURE

To what extent can governments promote cooperation by creating favorable conditions of play and by lengthening the shadow of the future? The literature on international regimes offers several techniques for creating favorable conditions of play. Explicit codification of norms

<sup>29</sup> Axelrod shows that in iterated Prisoners' Dilemma, where actors *can* reliably distinguish between cooperation and defection by others and respond in kind, Tit-for-Tat performs better than do alternative strategies. When recognition and control are perfect, iterated environments strongly favor the emergence of cooperation.

can limit definitional ambiguity. The very act of clarifying standards of conduct, of defining cooperative and uncooperative behavior, can permit more effective resort to strategies of reciprocity. Further, provisions for surveillance—for example, mechanisms for verification in arms control agreements or for sharing information on the nature and effects of domestic sectoral policies—can increase transparency. In practice, the goal of enhancing recognition capabilities is often central to negotiations under anarchy.

The game-theoretic and institutional microeconomic literatures offer several approaches to increasing the iterative character of situations. Thomas Schelling and Robert Axelrod suggest tactics of decomposition over time to lengthen the shadow of the future.<sup>30</sup> For example, the temptation to defect in a deal promising thirty billion dollars for a billion barrels of oil may be reduced if the deal is sliced up into a series of payments and deliveries. Cooperation in arms reduction or in territorial disengagement may be difficult if the reduction or disengagement must be achieved in one jump. If a reduction or disengagement can be sliced up into increments, the problem of cooperation may be rendered more tractable. Finally, strategies of issue linkage can be used to alter payoff structures and to interject elements of iterativeness into single-play situations. Relations among states are rarely limited to one single-play issue of overriding importance. When nations confront a single-play game on one issue, present defection may be deterred by threats of retaliation on other iterated issues. In international monetary affairs, for instance, a government fearing one-time reserve losses if another state devalues its currency may link devaluation to an iterated trade game. By establishing a direct connection between present behavior in a single-play game and future benefits in an iterated game, tacit or explicit cross-issue linkage can lengthen the shadow of the future.<sup>31</sup>

The shadow of the future, strategies of reciprocity, and payoff structure interact in determining the likelihood of cooperation. Incentives to cooperate and to defect are the discounted stream of anticipated payoffs across current and future encounters. The size of the discount rate affects the value of future benefits. A Tit-for-Tat strategy provides a clearer view of how present behavior is likely to affect an adversary's future behavior, and thereby sharpens differences between the anticipated

<sup>30</sup> Schelling (fn. 2), 43-46, and Axelrod (fn. 7), 126-32.

<sup>31</sup> For analyses of issue linkage, see Robert D. Tollison and Thomas D. Willett, "An Economic Theory of Mutually Advantageous Issue Linkages in International Negotiations," *International Organization* 33 (Autumn 1979) 425-49; Oye (fn. 12), chap. 3, "Bargaining: The Logic of Contingent Action"; and Axelrod and Keohane in the concluding essay of this symposium.

stream of payoffs for cooperation and defection. The structure of payoffs in each round of play is the object of the discounting and anticipating.

#### IV. NUMBER OF PLAYERS: TWO-PERSON AND N-PERSON GAMES

Up to now, I have discussed the effects of payoff structure and the shadow of the future on the prospects of cooperation in terms of two-person situations. What happens to the prospects for cooperation as the number of significant actors rises? In this section, I explain why the prospects for cooperation diminish as the number of players increases; examine the function of international regimes as a response to the problems created by large numbers; and offer strategies to improve the prospects for cooperation by altering situations to diminish the number of significant players.

The numbers problem is central to many areas of the social sciences. Mancur Olson's theory of collective action focuses on N-person versions of Prisoners' Dilemma. The optimism of our earlier discussions of cooperation under iterated Prisoners' Dilemma gives way to the pessimism of analyses of cooperation in the provision of public goods. Applications of Olsonian theory to problems ranging from cartelization to the provision of public goods in alliances underscore the significance of "free-riding" as an impediment to cooperation.<sup>32</sup> In international relations, the numbers problem has been central to two debates. The longstanding controversy over the stability of bipolar versus multipolar systems reduces to a debate over the impact of the number of significant actors on international conflict.<sup>33</sup> A more recent controversy, between proponents of the theory of hegemonic stability and advocates of international regimes, reduces to a debate over the effects of large numbers on the robustness of cooperation.<sup>34</sup>

<sup>32</sup> See Mancur Olson, Jr., *The Logic of Collective Action: Public Goods and the Theory of Groups* (Cambridge: Harvard University Press, 1965), and Mancur Olson and Richard Zeckhauser, "An Economic Theory of Alliances," *Review of Economics and Statistics* 48 (August 1966), 266-79. For a recent elegant summary and extension of the large literature on dilemmas of collective action, see Russell Hardin, *Collective Action* (Baltimore: Johns Hopkins University Press, 1982).

<sup>33</sup> See Kenneth N. Waltz, "The Stability of a Bipolar World," *Daedalus* 93 (Summer 1964), and Richard N. Rosecrance, "Bipolarity, Multipolarity, and the Future," *Journal of Conflict Resolution* (September 1966), 314-27.

<sup>34</sup> On hegemony, see Robert Gilpin, *U.S. Power and the Multinational Corporation* (New York: Basic Books, 1975), 258-59. On duopoly, see Timothy McKeown, "Hegemonic Stability Theory and 19th-Century Tariff Levels in Europe," *International Organization* 37 (Winter 1983), 73-91. On regimes and cooperation, see Keohane (fn. 11), and Krasner (fn. 5). On two-person games and N-person public-goods problems, see Charles Kindleberger, "Dominance and Leadership in the International Economy: Exploitation, Public Goods, and Free Rides," *International Studies Quarterly* 25 (June 1981), 242-54.

## A. NUMBER OF PLAYERS AND COOPERATION

How do numbers affect the likelihood of cooperation? There are at least three important channels of influence.<sup>35</sup> First, cooperation requires recognition of opportunities for the advancement of mutual interests, as well as policy coordination once these opportunities have been identified. As the number of players increases, transactions and information costs rise. In simple terms, the complexity of N-person situations militates against identification and realization of common interests. Avoiding nuclear war during the Cuban missile crisis called for cooperation by the Soviet Union and the United States. The transaction and information costs in this particularly harrowing crisis, though substantial, did not preclude cooperation. By contrast, the problem of identifying significant actors, defining interests, and negotiating agreements that embodied mutual interests in the N-actor case of 1914 was far more difficult. These secondary costs associated with attaining cooperative outcomes in N-actor cases erode the difference between CC and DD. More significantly, the intrinsic difficulty of anticipating the behavior of other players and of weighing the value of the future goes up with the number of players. The complexity of solving N-person games, even in the purely deductive sense, has stunted the development of formal work on the problem. This complexity is even greater in real situations, and operates against multilateral cooperation.

Second, as the number of players increases, the likelihood of autonomous defection and of recognition and control problems increases. Cooperative behavior rests on calculations of expected utility—merging discount rates, payoff structures, and anticipated behavior of other players. Discount rates and approaches to calculation are likely to vary across actors, and the prospects for mutual cooperation may decline as the number of players and the probable heterogeneity of actors increases. The chances of including a state that discounts the future heavily, that is too weak (domestically) to detect, react, or implement a strategy of reciprocity, that cannot distinguish reliably between cooperation and defection by other states, or that departs from even minimal standards of rationality increase with the number of states in a game. For example, many pessimistic analyses of the consequences of nuclear proliferation focus on how breakdowns of deterrence may become more likely as the number of countries with nuclear weapons increases.<sup>36</sup>

Third, as the number of players increases, the feasibility of sanctioning defectors diminishes. Strategies of reciprocity become more difficult to

<sup>35</sup> See Keohane (fn. 11), chap. 6, for extensions of these points.

<sup>36</sup> See Lewis A. Dunn, *Controlling the Bomb* (New Haven: Yale University Press, 1982).

implement without triggering a collapse of cooperation. In two-person games, Tit-for-Tat works well because the costs of defection are focused on only one other party. If defection imposes costs on all parties in an N-person game, however, the power of strategies of reciprocity is undermined. The infeasibility of sanctioning defectors creates the possibility of free-riding. What happens if we increase the number of actors in the iterated Prisoners' Dilemma from 2 to 20? Confession by any one of them could lead to the conviction of all on the major charge; therefore, the threat to retaliate against defection in the present with defection in the future will impose costs on all prisoners, and could lead to wholesale defection in subsequent rounds. For example, under the 1914 system of alliances, retaliation against one member of the alliance was the equivalent of retaliation against all. In N-person games, a strategy of conditional defection can have the effect of spreading, rather than containing, defection.

#### B. STRATEGIES OF INSTITUTIONALIZATION AND DECOMPOSITION

Given a large number of players, what strategies can states use to increase the likelihood of cooperation? Regime creation can increase the likelihood of cooperation in N-person games.<sup>37</sup> First, conventions provide rules of thumb that can diminish transaction and information costs. Second, collective enforcement mechanisms both decrease the likelihood of autonomous defection and permit selective punishment of violators of norms. These two functions of international regimes directly address problems created by large numbers of players. For example, Japan and the members of NATO profess a mutual interest in limiting flows of militarily useful goods and technology to the Soviet Union. Obviously, all suppliers of militarily useful goods and technology must cooperate to deny the Soviet Union access to such items. Although governments differ in their assessment of the military value of some goods and technologies, there is consensus on a rather lengthy list of prohibited items. By facilitating agreement on the prohibited list, the Coordinating Committee of the Consultative Group of NATO (CoCom) provides a relatively clear definition of what exports would constitute defection. By defining the scope of defection, the CoCom list forestalls the necessity of retaliation against nations that ship technology or goods that do not fall within the consensual definition of defection.<sup>38</sup> Generally, cooper-

<sup>37</sup> In addition to providing a partial solution to the problems of large numbers, regimes may affect the order and intensity of actor preferences as norms are internalized, and may heighten the iterativeness of situations as interaction becomes more frequent.

<sup>38</sup> For a full analysis of intra-alliance cooperation on East-West trade, see Michael Mastanduno, "Strategies of Economic Containment: U.S. Trade Relations with the Soviet

ation is a prerequisite of regime creation. The creation of rules of thumb and mechanisms of collective enforcement and the maintenance and administration of regimes can demand an extraordinary degree of cooperation. This problem may limit the range of situations susceptible to modification through regimist strategies.

What strategies can reduce the number of significant players in a game and thereby render cooperation more likely? When governments are unable to cooperate on a global scale, they often turn to discriminatory strategies to encourage bilateral or regional cooperation. Tactics of decomposition across actors can, at times, improve the prospects for cooperation. Both the possibilities and the limits of strategies to reduce the number of players are evident in the discussions that follow. First, reductions in the number of actors can usually only be purchased at the expense of the magnitude of gains from cooperation. The benefits of regional openness are smaller than the gains from global openness. A bilateral clearing arrangement is less economically efficient than a multi-lateral clearing arrangement. Strategies to reduce the number of players in a game generally diminish the gains from cooperation while they increase the likelihood and robustness of cooperation.<sup>39</sup> Second, strategies to reduce the number of players generally impose substantial costs on third parties. These externalities may motivate third parties to undermine the limited area of cooperation or may serve as an impetus for a third party to enlarge the zone of cooperation. In the 1930s, for example, wholesale resort to discriminatory trading policies facilitated creation of exclusive zones of commercial openness. When confronted by a shrinking market share, Great Britain adopted a less liberal and more discriminatory commercial policy in order to secure preferential access to its empire and to undermine preferential agreements between other countries. As the American market share diminished, the United States adopted a more liberal and more discriminatory commercial policy to increase its access to export markets. It is not possible, however, to reduce the number of players in all situations. For example, compare the example of limited commercial openness with the example of a limited strategic embargo. To reduce the number of actors in a trade war, market access can simply be offered to only one country and withheld from others. By contrast, defection by only one supplier can permit the target

---

Union," *World Politics* 37 (July 1985), 503-31, and Beverly Crawford and Stephanie Lenway, "Decision Modes and International Regime Change: Western Collaboration on East-West Trade," *World Politics* 37 (April 1985), 375-402.

<sup>39</sup> For a pure libertarian argument on private exchange as an alternative to public management, see Conybeare (fn. 12).

of a strategic embargo to obtain a critical technology. These problems may limit the range of situations susceptible to modification through strategies that reduce the number of players in games.

#### IV. CONCLUSION

As I noted at the outset, the analytic approach presented in this symposium constitutes an implicit attack on the traditional boundary between studies of international political economy and studies of security. The emphasis on cooperation, the reliance on the three circumstantial dimensions, and the analysis of associated strategies to alter circumstances are not specific to either security affairs or political economy. This essay and Duncan Snidal's complementary introduction, "The Game *Theory* of International Politics," define and operationalize the three sets of abstract explanatory and prescriptive propositions, and discuss the uses and abuses of game theory in the empirical study of international politics. The six empirical essays in the main body of this collection provide a limited trial of these propositions by probing diverse situations, strategies, and outcomes in both security and economic affairs.<sup>40</sup>

In the first of the three case studies in security affairs, Robert Jervis explains the incidence, scope, and duration of great-power concerts. He begins by noting that counterhegemonic war appears to be a necessary condition for the emergence of concert, and then offers an explanation of why the Concert of Europe lasted from 1815 to 1854, but attempts at concert following World Wars I and II collapsed. His analysis stresses the effects of an international structural cause—counterhegemonic war—and of concert itself on the preconditions for cooperation.

Stephen Van Evera explains the collapse of a fragile peace in 1914. His analysis stresses the effects of a family of ideas—militarism, nationalism, and social imperialism—on the governing elites' perceptions of their interests and of each other. Van Evera suggests that these ideas undermined each of the three situational preconditions for cooperation, and are necessary to the explanation of the outbreak of the First World War.

George Downs, David Rocke, and Randolph Siverson transcend some of the superficial controversies over strategy that divide analysts of arms control. Their essay identifies conditions that determine when unilateral

<sup>40</sup> See Alexander George and Richard Smoke, *Deterrence in American Foreign Policy* (New York: Columbia University Press, 1974) for a seminal example of how an austere theoretical framework and detailed historical cases can promote both development of theory and historical understanding.

action, tacit bargaining, and explicit negotiation are likely to reduce the intensity of arms races. Their analysis of 19th- and 20th-century arms races that did not terminate in war stresses the effects of payoff structure and of problems of recognition and control on the efficacy of arms-control strategies.

In the first of the case studies in political economy, John Conybear examines factors that may promote and inhibit commercial cooperation. He explains why cooperation was not robust during the perpetual iterations of the Anglo-Hanse conflict, how asymmetries of power initially impeded cooperation in the late 19th-century Franco-Italian case, and how the “publicness” of the Hawley-Smoot tariff impeded cooperation during the 1930s.

Between 1930 and 1936, international monetary relations were marked by the collapse of fixed exchange rates and resort to competitive devaluation, the emergence of bilateral and regional cooperation, and limited monetary coordination under the Tripartite Stabilization Agreement. Kenneth Oye considers circumstantial and strategic determinants of the incidence and scope of monetary cooperation in the 1930s.

In times of financial crisis, individual creditors can derive benefit from limiting their exposure to protect themselves against default. But if many creditors limit their exposure, default is assured. In his essay, Charles Lipson notes that contemporary debt rescheduling requires the cooperation of literally hundreds of creditors, and explains how private sanctions and institutional settings have fostered cooperation (to date).

By juxtaposing a generic analytic framework and two sets of cases organized along traditional subdisciplinary boundaries, the contributors to this collection encourage speculation along several lines. First, to what extent do cases in security affairs and political economy tend to fall into different areas of the space defined by the three situational dimensions? Second, to what extent does readiness to resort to associated sets of strategies appear to differ in security affairs and political economy? Third, what aspects of cooperation in security affairs and political economy are *not* explained by the core approach employed in this volume? Finally, what additional situational and strategic variables might improve the quality of explanation?

In the concluding essay, Robert Axelrod and Robert Keohane consider these questions. They begin by examining the fit between observed cooperation and conflict, and the three sets of situational preconditions. They then review the case studies, assessing the possibilities and limits of strategies to alter payoff structure, to lengthen the shadow of the future and create favorable conditions of play, and to reduce numbers



of players, with particular emphasis on reciprocity and regime building. Axelrod and Keohane ultimately move toward a new synthesis. They suggest that international regimes can reinforce and institutionalize reciprocity, and that nations have enhanced the prospects for cooperation by relying on a combination of atomistic reciprocity and regime establishment.