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# Bargaining, Enforcement, and International Cooperation

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## Introduction

A cluster of arguments referred to as “cooperation theory” or “neoliberal institutionalism” stands as one of the more interesting and important developments in international relations theory in the last fifteen years.<sup>1</sup> Focused on the problems of whether and how states might cooperate for mutual advantage despite the absence of supranational government (anarchy), these arguments may be summarized as follows.

Cooperation theorists argued that different international issues and issue domains—trade, finance, arms control, the environment, and so on—may have different strategic structures, and these crucially affect the prospects for international cooperation and the nature of the specific problems states must overcome to achieve it. The different strategic structures have typically been characterized by reference to simple  $2 \times 2$  matrix games such as Prisoners’ Dilemma, Chicken, Harmony, Deadlock, Stag Hunt, and Pure Coordination.<sup>2</sup> Analysts have focused primarily on Prisoners’ Dilemma problems and, to a much lesser degree, on coordination problems.

Scholars working in the realist tradition had already suggested that cooperation may occur when states are “playing a coordination game” such as allying against a common threat or choosing telecommunications standards. They argued, however, that cooperation is more difficult in Prisoners’ Dilemma-like situations, which they imply are more prevalent and more fundamental in international politics.<sup>3</sup> In re-

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1. See in particular Axelrod 1984; Keohane 1984; Lipsen 1984; Oye 1986a; Snidal 1985; and Stein 1982.

2. See Oye 1986a for a description of these games in an international relations context.

3. See in particular Jervis 1978 and Waltz 1979 (for example, 107–11). Specific issue domains that have been characterized as having a Prisoners’ Dilemma-like structure are arms levels and force structures (for example, Downs, Rocke, and Siverson 1986; and Waltz 1979, 110); competitive alliance formation (Snyder 1984); arms levels within alliances (Olson and Zeckhauser 1966); imperialism and territorial

sponse, cooperation theorists observed that if states interact repeatedly on a particular issue—which they typically do—cooperation in Prisoners’ Dilemma-like situations might be sustained by mechanisms of conditional retaliation such as Tit-for-Tat. For example, mutually beneficial cooperation in satellite reconnaissance might be sustained by the implicit threat that “if you try to shoot down our spy satellites, we will shoot down yours.” A key condition for such mechanisms to work is that the “shadow of the future” be long enough—the states have to care sufficiently about future payoffs and expect that future interactions are likely enough for the threat of retaliation to deter cheating. Cooperation theorists further suggested that international institutions might serve to extend the shadow of the future by regularizing interactions and to facilitate the information flows and monitoring necessary to make mechanisms of conditional retaliation work.

In this article I develop two main arguments bearing on these central propositions of cooperation theory. First, while conceiving of different issue domains in terms of different strategic structures may be heuristically useful for some purposes, doing so misunderstands the problem of international cooperation as state leaders typically face it. I argue that understanding problems of international cooperation as having a common strategic structure is more accurate and perhaps more theoretically fruitful. Empirically, there are always many possible ways to arrange an arms, trade, financial, or environmental treaty, and before states can cooperate to enforce an agreement they must bargain to decide which one to implement. Thus, regardless of the substantive domain, problems of international cooperation typically involve first a bargaining problem (akin to various coordination games that have been studied) and next an enforcement problem (akin to a Prisoners’ Dilemma game). To specify and explore this conception analytically, I develop a game-theoretic model that depicts problems of international cooperation as having two linked phases. In the first phase, states bargain over the particular deal to be implemented in the second, “enforcement phase” of the game, which is modeled as a repeated Prisoners’ Dilemma.

Second, using this model I show that the bargaining and enforcement problems can interact in an interesting way that cuts against the received wisdom of cooperation theory. Whereas cooperation theorists argued that a longer shadow of the future makes cooperation sustainable and so more likely, the analysis here suggests that though a long shadow of the future may make *enforcing* an international agreement easier, it can also give states an incentive to *bargain harder*, delaying agreement in hopes of getting a better deal. For example, the more an international regime creates durable expectations of future interactions on the issues in question, the greater the incentive for states to bargain hard for favorable terms, possibly making cooperation

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aggrandizement (for example, Jervis 1976, 66; Howard 1972 is consistent with this interpretation as well); tariff and nontariff barrier policies in trade (for example, Brander and Spencer 1984; and Conybeare 1987); competitive exchange-rate manipulation (Caves, Frankel, and Jones 1993, 549–50); intervention and efforts to dominate peripheral and buffer states (Larson 1987); first-strike incentives and “the security dilemma” (Jervis 1978; and Van Evera 1984); and global commons problems (Hardin 1968).

harder to reach. The shadow of the future thus appears to cut two ways. Necessary to make cooperative deals sustainable, it nonetheless may encourage states to delay in bargaining over the terms.<sup>4</sup>

These arguments and the model are presented in the second and third sections of the article. In the fourth section I briefly assess empirical implications of these theoretical claims, arguing in particular that the theory may make better sense of the early Cold War arms competition than received cooperation theory can. The conclusion compares the bargaining problem to the relative-gains problem and notes some implications for understanding international regimes.

## Strategic Structure and Problems of International Cooperation

Whether the goal is to control arms racing, reduce the risk of preemptive war, limit global environmental damage, stabilize exchange rates, or reduce protectionism in trade, state leaders need to coordinate state policies and the actions of the relevant state bureaucracies if they wish to gain various benefits of cooperating. Cooperation theorists proposed that such diverse problems might be usefully analyzed by focusing on the *strategic structure* of the decision problem faced by state leaders contemplating cooperation. As exemplified by the 1985 *World Politics* volume titled "Cooperation Under Anarchy," strategic structures were understood in terms of simple  $2 \times 2$  games, which include a description of two policy choices available to each state (typically labeled "cooperate" and "defect"), an outcome associated with each of the four combinations of policy choices, and preferences for each state over the four outcomes.<sup>5</sup>

As noted earlier, the various arguments making up cooperation theory advance two, not entirely consistent, propositions. First, different issue domains have different strategic structures with different consequences for the likelihood of international cooperation. Second, many or even most domains have the structure of a repeated Prisoners' Dilemma and so may allow international cooperation by means of a Tit-for-Tat-like regime if state leaders perceive a long enough shadow of the future. Because it more directly challenges the realist claim that cooperation under anarchy is very difficult, the second proposition has attracted the most attention and controversy, chiefly in the form of the relative-gains debate.<sup>6</sup> In addition, empirical work drawing

4. Discussing the possible effects of iteration on play in a simultaneous-move coordination game, Duncan Snidal (1985, 36) suggested that a longer shadow of the future could give states "incentives to be more concerned with the exact distributional consequences of particular coordination outcomes," although he argued that "these considerations will still typically be dominated by the overall stability of the coordination situation." Oye (1986a, 14) makes a related conjecture about the effect of repetition on play in Chicken games.

5. The 1985 *World Politics* issue was reprinted as Oye 1986a.

6. See Jervis 1988, however, for a broader range of criticisms that generally equate both game theory and cooperation theory with the study of repeated Prisoners' Dilemmas. See also Gowa 1986 and Milner

on cooperation theory has generally attempted to characterize different international issue domains and problems as repeated Prisoners' Dilemmas,<sup>7</sup> while empirical instances of coordination problems have been relatively neglected.<sup>8</sup>

Despite the greater attention paid to the second argument, I would argue that the first set of propositions is integral to the way that cooperation theory envisions international politics. Further, the "different strategic structures" argument has (often unwittingly) shaped the major questions asked by scholars working in this research program.

Regarding the importance of the argument, two of the earliest theoretical articles in cooperation theory maintained that empirically, states face two types of problems of international cooperation, labeled "coordination versus collaboration" by Arthur Stein and "coordination versus Prisoner's Dilemma" by Duncan Snidal.<sup>9</sup> Both Stein and Snidal argued that differences in international regimes could be explained according to whether they focused on solving a problem of coordination or collaboration (Prisoners' Dilemma), which was held to depend on the nature of the issues in question. For example, Stein saw the Strategic Arms Limitation Talks (SALT) agreements, market-sharing arrangements like the International Coffee Agreement, and international "commons" dilemmas as regimes addressing Prisoners' Dilemma-like problems, whereas product standardization agreements and international radio and airplane traffic conventions were cited as instances of regimes focused on problems of coordination.<sup>10</sup>

The same thesis is very much in evidence in the "Cooperation Under Anarchy" volume, where Kenneth Oye and other contributors made the "payoff structure" in different  $2 \times 2$  games one of their three major independent variables for explaining variation in cooperation across cases and issue domains.<sup>11</sup> Oye in fact ranged the several  $2 \times 2$  games used by the authors on a rough scale reflecting the degree to which the strategic structure in question was hypothesized to favor cooperation.<sup>12</sup>

The idea that different international issues and issue domains have different strategic structures has had at least three important consequences for the evolution of research on international cooperation. First, by leading scholars to ask "Which  $2 \times 2$  game best characterizes the specific empirical case that I am interested in?", the idea of different strategic structures inevitably led scholars to focus on the question "What are the preferences?", understood as how the states in question would rank the four

1992. For the relative-gains debate, see Grieco 1988 and Baldwin 1993. Glaser (1994–95) argues that, rightly understood, neorealism predicts the international cooperation under some circumstances.

7. For a few examples, see Downs and Rocke 1990, 1995; Evangelista 1990; Keohane 1984, 1986; Larson 1987; Rhodes 1989; and Weber 1991.

8. Important exceptions include Krasner 1991; Garrett 1992; Sebenius 1992; and Morrow 1994.

9. See Stein 1982; and Snidal 1985.

10. See Martin 1992 and 1993b for more recent applications of this approach to explaining cooperation in economic sanctioning and variation in the design of multilateral institutions.

11. An influential earlier example of this approach was Snyder and Diesing 1977, who had argued that variation in bargaining behavior in international crises could be understood in terms of different strategic structures in  $2 \times 2$  games.

12. Oye 1986a, 6–11; see also Snidal 1991, 707.

outcomes deemed possible by the theoretical setup. But cooperation theory provided no guidance here, and the problem of how to assign preferences often seems so difficult or controversial as to render the exercise pointless—most of the “action” of the theory is loaded into the arguments about what the right preferences are and how exactly to characterize what “cooperate” and “defect” mean in a particular setting.<sup>13</sup> Mainly due to this problem of assigning preferences, analysis of problems of international cooperation in terms of different  $2 \times 2$  games has not blossomed, although on the plus side the problem helped lead researchers to look more carefully at how multiple domestic actors with diverse goals interact to influence the foreign policy preferences and strategies of the “chief of government.”<sup>14</sup> As I will argue, one reason that assigning preferences to define the “right”  $2 \times 2$  game is so difficult as an empirical matter may be that such games are simply bad models of the strategic problem that leaders typically confront when they are contemplating international cooperation.

A second significant consequence of the “different strategic structures” idea has been a running debate over the relative empirical importance of Prisoners’ Dilemma and coordination problems as obstacles to international cooperation. This is seen most clearly in Stephen Krasner’s “Global Communications and National Power,” where he argues that coordination problems such as the  $2 \times 2$  game Battle of the Sexes are empirically more prevalent than problems of “market failure,” a reference to Prisoners’ Dilemma-like problems of cheating and enforcement.<sup>15</sup> This framing suggests an either/or choice in characterizing which strategic structure, coordination or Prisoners’ Dilemma, is most common and important in international relations. The idea of “coordination versus Prisoners’ Dilemma” also appears among proponents of the relative-gains argument, whom Krasner cites as providing supporting evidence for his thesis and who cite Krasner in turn, thus establishing a loose (and, as I later argue, dubious) association between coordination problems and the relative-gains argument.<sup>16</sup>

The third significant consequence of the “different strategic structures” idea is the most relevant for the argument of this article. By defining the realm of interesting possibilities as coordination and Prisoners’ Dilemma games, cooperation theorists fostered considerable confusion about how international relations scholars should think about international *bargaining*. The confusion is due to the fact that bargaining problems are not well represented by any  $2 \times 2$  game. Indeed, coordination games such as Chicken and Battle of the Sexes are such minimal models of the bargaining problem that in the international relations literature they generally are not understood

13. Snidal (1991, 704) notes that “Choosing among such different [strategic structures] . . . poses a tough problem at the foundations of IR theory.”

14. See, in particular, Putnam 1988; Evans, Jacobson, and Putnam 1993; and Keohane and Milner 1996. For recent work drawing on the  $2 \times 2$  game approach, see Aggarwal 1996; Conybeare 1987; Martin 1992, 1993b; and Weber 1991. Evangelista (1990, 526) explicitly argues that his study “reinforces criticisms of game theoretic approaches that posit the state as a unitary actor.”

15. Krasner 1991.

16. See Krasner 1991, 362, 365; and Grieco 1993, 320.

as being about bargaining at all.<sup>17</sup> For this reason and because of the “either coordination or Prisoners’ Dilemma” framing, many scholars using cooperation theory treated repeated Prisoners’ Dilemma inappropriately as a model of international bargaining, when it is better understood as a model of the problem of enforcing a particular agreement given short-run incentives to renege.

In the classic theoretical sense elaborated by John Nash and Thomas Schelling, a bargaining problem refers to a situation where there are multiple self-enforcing agreements or outcomes that two or more parties would all prefer to no agreement, but the parties disagree in their ranking of the mutually preferable agreements.<sup>18</sup> As an empirical matter, a second characteristic feature of bargaining problems is that they are dynamic. They are resolved, if at all, through time, in sequences of offers and counteroffers or with one or both parties “holding out” in hope that the other will make concessions.<sup>19</sup> A final empirically significant aspect of bargaining problems is that they typically involve uncertainty or private information about what the other side’s true “bottom line” is and thus possibilities for bluffing and misrepresentation.

Given this understanding of the nature of a bargaining problem, it is immediately apparent that virtually all efforts at international cooperation must begin by resolving one. Regardless of whether the specific domain is arms control, trade talks, exchange-rate coordination, or environmental regulation, there will almost invariably be *many* possible ways of writing the treaty or agreement that defines the terms of cooperation, and the states involved will surely have conflicting preferences over some subset of these various possibilities. Further, in practice the resolution of such a bargaining problem will take place, if at all, in a series of offers and counteroffers or with states holding out for their preferred option. And of course uncertainty about the minimum that the other side would accept is often important in international negotiations.<sup>20</sup>

At the same time, most efforts at international cooperation also involve issues of monitoring and enforcement. Once a deal is struck on the terms of cooperation—as at a GATT round or an IMF negotiation, for example—the next task is typically to implement, monitor, and enforce the agreement. A very few international agreements (such as air traffic control guidelines) may be largely self-implementing and self-enforcing without any special arrangements. But in the majority of cases, the parties involved recognize that there may be incentives for them to renege in various ways

17. For example, Krasner groups Chicken with Prisoners’ Dilemma as an example of a “market failure problem” rather than one of coordination with conflicting interests, as most game theorists see it. He also observes, more justifiably, that in the international relations literature “Battle of the Sexes is hardly noted at all as a possible payoff matrix” (1991, 361).

18. See Nash 1950; and Schelling 1960, chap. 2. Chicken and Battle of the Sexes are thus minimal models of such a problem. Technically, folk theorems (for example, Fudenberg and Tirole 1991, chap. 5) imply that practically all infinitely repeated “mixed motive” games can be bargaining problems in this most basic sense, although the extensive forms of games such as repeated Prisoners’ Dilemma are difficult to interpret as models of a bargaining process.

19. The first successful formalization of the dynamic aspect of bargaining is Rubinstein 1982. For applications in international relations, see Powell 1996; Fearon 1995; and Wagner 1996.

20. See, for examples, Morrow 1989; Powell 1990; and Fearon 1992, 1994a, 1995.

on aspects of the deal, and they set up governance structures—regimes—of varying complexity to cope with this.<sup>21</sup>

It follows, then, that the empirical problem faced by states contemplating international cooperation cannot be grasped by a theoretical apparatus that poses an either/or distinction between coordination and collaboration problems. In a broad range of empirical settings, getting to international cooperation involves first a bargaining problem and, second, issues of monitoring and enforcement. This simple observation is obscured by the theoretical apparatus of received cooperation theory. In the next section I consider a model in which the problem of bargaining (coordination with conflicting interests) and enforcement are combined in sequence in order to examine how they interact.<sup>22</sup>

Before developing this conception, a further distinction should be made, one that is also unclear in received cooperation theory. Empirically, problems of international cooperation may involve either (1) bargaining over the division of *new* or potential benefits; or (2) attempts to *renegotiate* an existing cooperative arrangement, where one party threatens to revert to noncooperation if the present terms are not adjusted. In the first class of cases, something happens to “open up” a set of deals that both or all parties would prefer to the status quo. For example, new ideas or more consensual scientific knowledge may lead state leaders to see potential benefits from cooperation on environmental problems, as with the Mediterranean Plan, the 1979 Convention on Long-Range Transboundary Air Pollution (LRTAP), the Montreal Ozone Protocol, or certain aspects of the Law of the Sea Treaty.<sup>23</sup> Alternatively, a change in domestic political circumstances may lead government leaders to see new potential gains from collaboration, as when a political party with stronger commitments to liberalizing trade comes to power or the costs of arms racing or agricultural price supports generate new domestic political pressures.<sup>24</sup> And, of course, technological and economic changes can produce new benefits obtainable by international cooperation, as when the globalization of capital markets creates gains for international macroeconomic and exchange-rate coordination, or when satellite technology makes possible arms control monitoring that in turn makes mutually beneficial arms treaties newly feasible.

In the second type of problem the states involved have already negotiated, tacitly or explicitly, a cooperative arrangement, and some change leads one or more to want to renegotiate the terms. In recent years, threatened trade wars among the OECD countries provide the most striking examples—one state (typically the United States)

21. Governance structures may also be desired as means for handling unforeseen contingencies, which are often problematic because they render unclear what constitutes renegeing. See Hart 1995; and Williamson 1975.

22. The effort parallels that of Morrow (1994), who showed how distributional conflicts might interfere with mutually advantageous pooling of information in regimes. Garrett (1992) and Garrett and Weingast (1993) have also stressed that questions of distribution and enforcement both appear in typical problems of international cooperation.

23. See E. Haas 1980; and P. Haas 1990, 1992.

24. See Paarlberg 1997, 419–20, for an interesting example concerning farm policies and the Uruguay Round.

threatens to begin a mutually damaging trade war by unilaterally imposing tariffs or other protective measures unless the others renegotiate more favorable terms of market access.<sup>25</sup> In terms of strategic structure, problems of this sort are similar to cases of international crisis bargaining in which one state threatens military action and war (mutually costly noncooperation) in the event of failed efforts at renegotiation.<sup>26</sup> It should be noted, however, that once the phase of “trade war” or costly noncooperation has begun, problems of international renegotiation are structurally similar to problems of dividing up new benefits. Although the model developed in the next section depicts the first type of problem—bargaining over newly available benefits—it can also be understood as a model of renegotiation once the “trade war” or other costly conflict has begun. In addition, note that after an initial agreement is reached, bargaining problems may recur as circumstances change or relative power shifts, leading to efforts at renegotiation. Indeed, some international regimes build in formal arrangements for periodic renegotiation of prior agreements, and to an extent they might even be identified with these institutions of renegotiation.<sup>27</sup>

Saying that diverse international issue domains can be productively viewed as having a common strategic structure does not imply that bargaining and enforcement issues arise in the same manner in all issue areas if these are considered at a lower level of generality. My point is simply that reflection on the empirical problem faced by states wishing to cooperate suggests that, taken as dichotomous alternatives, coordination games and Prisoners’ Dilemma-type games are misleading theoretical models. Almost regardless of the substantive domain, states will face *both* a bargaining problem *and* problems of enforcement, and it is natural to expect that the two problems will interact. To ask “which is more common empirically?” or to treat a model of enforcement (repeated Prisoners’ Dilemma) as a model of bargaining is to start with a theoretical apparatus ill-suited for the empirical matter at hand.

### **A Model in Which States Bargain to Determine Which Agreement to Enforce**

I will consider a model in which two states must bargain to decide which of two possible deals they will implement before they can begin cooperating. The states are assumed to have conflicting preferences over the two deals. Both would prefer coordinating on either one of the two packages to noncooperation, but they differ over their most preferred package. Once the states reach agreement in the bargaining phase, they begin the enforcement phase, in which the deal they agreed to establishes

25. For analyses of cases of this sort, see Bhagwati and Patrick 1990; Conybeare 1986; Odell 1993; Noland 1997; and Rhodes 1989.

26. For theoretical work that understands crisis bargaining in these terms, see Fearon 1992, 1994a; Morrow 1989; Nalebuff 1986; and Powell 1990. On a related problem concerning economic sanctions, see Martin 1993a.

27. Koremenos (1996) gives examples along with an analysis of state motivations for renegotiation and how its anticipation affects regime design.

the payoffs for mutual cooperation. In the enforcement phase the states have a short-run incentive to defect, to renege on the agreement while the other side cooperates. Thus in the enforcement phase the states engage in a classical repeated Prisoners' Dilemma.

By restricting attention to the simplest case of two possible cooperative deals, I can model the bargaining phase as a war of attrition, a simple bargaining model that has a number of appealing features. In the classical war of attrition, two parties choose lengths of time to hold out for the prize in question (here, the better cooperative deal), and holding out is costly. The first player to quit the contest cedes the prize to the other side. As an international politics example, we might think of the United States and France each refusing to back down over whether the French will make a specific trade concession.<sup>28</sup> Delay is costly here for two main reasons. First, delay means more time spent without the benefits an agreement would bring; second, as time passes there may be some growing risk that one side will break off negotiations entirely and look for other trading partners (for example, drop GATT in favor of a regional trade bloc).

As an empirical matter, international bargaining often takes the appearance of a war of attrition—two sides holding out, waiting in the hope that the other will make some significant concession first. This holds true at least for international crises, U.S.-Soviet arms control bargaining, and bargaining in GATT rounds; so there is some justification for using a war-of-attrition model for the bargaining phase.<sup>29</sup> However, it should be stressed that the issues states bargain over are typically divisible in many more ways than two. Something more like “continuous offer” bargaining is normally possible in principle, and if states do not make smooth sequences of offers (as in, say, bargaining over the price of a car), this is because for some reason they choose not to. For example, states are not really unitary actors, and the need to forge a domestic consensus among relevant bureaucracies and interest groups may make it very costly for state leaders to generate new offers. I will discuss the possible consequences of allowing for continuous-offer bargaining at the end of the section.

### *The Model*

There are two states, 1 and 2, that attempt in the first phase of the game to select a particular cooperative deal from a set of possible deals. Let the interval  $X = [0, 1]$  be the policy space, with each point in  $X$  representing the terms of a particular cooperative agreement. Let state 1's utility for the deal  $z \in X$  be  $z$ , while state 2's is  $1-z$ . Thus the states have conflicting preferences over the deals in  $X$ . State 1 likes deals closer to

28. See, for example, Roger Cohen, “Culture Dispute with Paris Now Snags World Accord,” *New York Times*, 8 December 1993, A1.

29. On crises as attrition contests, see Nalebuff 1986; and Fearon 1994a. On arms control and trade bargaining, see the examples discussed later. Interestingly, in the econometric literature on labor strikes, war-of-attrition models tend to do better empirically than other, more “continuous” bargaining models. See Kennan and Wilson 1989.

	Cooperate	Defect
Cooperate	$z, 1 - z$	$-b, a$
Defect	$a, -b$	$-c_1, -c_2$

Note:  $a > 1, b > c_i (i = 1, 2), z \in [0, 1]$ , and  $a - b < 0$ .

FIGURE 1. Per-unit-time payoffs in the enforcement phase (a prisoners' dilemma)

1, state 2 likes deals closer to 0. For concreteness we could think of  $z \in X$  as some measure of state 2's trade openness to state 1's products.

As discussed earlier, I will assume that for whatever reason only two deals in  $X$  can actually be implemented or that coming up with alternative proposals is prohibitively costly. Let this set of feasible agreements be  $A = \{x, y\}$ , where  $x > y$ . Thus state 1 prefers agreement  $x$ , whereas 2 prefers  $y$ . To illustrate, we could take  $x$  to be a trade deal in which state 2 lowers its barriers to a particular product produced mainly by state 1, and  $y$  to be the same deal without this concession.

The enforcement phase of the game will be described first. If the states manage to agree on a particular deal  $z \in A$  in the bargaining phase, they will play a continuous-time Prisoners' Dilemma with payoffs per unit of time represented in Figure 1.<sup>30</sup> The deal agreed to establishes the per-unit-time payoffs for the mutual cooperation outcome.  $a > 1$  is the per-unit-time gain from defecting while the other player cooperates, and  $b > 0$  is the per-unit-time cost of being "the sucker."<sup>31</sup>  $c_1$  and  $c_2$  are the states' per-unit-time costs for mutual defection (assume that  $b$  is greater than both  $c_1$  and  $c_2$ ). Finally, in order to make it possible for a state to gain by defecting, assume that if a state switches strategies at time  $t$ , the other state is unable either to detect or to respond to this switch for a length of time  $\Delta > 0$ . The term  $\Delta$  represents the *detection lag*. If states could instantaneously detect and respond to defection by another state, there would be no short-term gain from renegeing and so no problem of enforcement. Thus  $\Delta$  is naturally interpreted as a measure of how easy or difficult it is to monitor the terms of an agreement, with smaller  $\Delta$ 's implying greater efficacy of monitoring arrangements.

I now describe the bargaining phase that precedes the enforcement phase. The game starts at time  $t = 0$ . A pure strategy for a state in this phase is a choice of a "quit time"  $t_i \geq 0$  ( $i = 1, 2$ ). This is the time at which state  $i$  will concede the better deal if the other side has not already done so.<sup>32</sup> Thus a state's quit time  $t_i$  determines how long it will incur the costs of noncooperation, holding out in hope of getting the

30. I would prefer to use a discrete-time repeated Prisoners' Dilemma, as does the international relations literature, but unfortunately the war-of-attrition bargaining phase is more conveniently modeled in continuous time.

31. Further, assume that  $a - b < 0$  so that mutual cooperation is Pareto efficient for all  $z \in X$ .

32. Assume that if both states "quit" at the same time, the deal implemented is chosen by a fair lottery.

better deal. For example, if  $t_1 < t_2$ , the states will move at time  $t_1$  to the enforcement phase with  $y$  as the cooperative deal to be implemented—state 2 gets its preferred deal because state 1 “caved in” first. It is natural to say that the longer a state plans to hold out (the bigger  $t_i$ ), the tougher its bargaining strategy.

While the states hold out in the bargaining phase, they incur per-unit-time costs  $c_1$  and  $c_2$ . The idea is that before they reach an agreement about how to cooperate, both suffer the costs of noncooperation. Finally, in both phases the states discount payoffs according to a constant discount rate  $r > 0$ . When  $r$  is close to zero, the states discount future payoffs very little so that the shadow of the future is long. The greater  $r$ , the more states discount future payoffs, and the shorter the shadow of the future.

Thus there are *two* costs for delay in the bargaining phase. First, there is the usual discount rate, or shadow of the future, assumed to affect both players. Second, there is the opportunity cost of living with the status quo relative to a cooperative agreement, which varies with the cost terms  $c_1$  and  $c_2$ . Differences in costs for noncooperation can be thought of as reflecting the *states' relative power* on the specific issue in question. It is natural to say that the state with lower costs for noncooperation is more powerful, because it has less to lose from not cooperating.

### Analysis

Clearly, expectations about what will happen in the enforcement phase will affect how the states bargain. Suppose, for example, that the states expect that neither agreement ( $x$  or  $y$ ) would be enforceable, so that the “both defect” outcome would prevail in the second phase. Then there is no incentive to bargain seriously. A state may as well hold out forever or concede the better deal at any time with no intention of observing the agreement. An interesting substantive implication follows. If states anticipate that obstacles to monitoring and enforcement would make any cooperative agreement in an issue area unstable, they have no incentive to negotiate or to negotiate seriously. Thus there is a potentially important *selection effect* behind cases of international negotiations aimed at cooperation. We should observe serious attempts at international cooperation in cases where the monitoring and enforcement dilemmas are probably resolvable. Other obstacles to cooperation, such as bargaining inefficiencies, may then *appear* to be the more significant constraints in the cases we actually observe.<sup>33</sup>

Under what conditions will a particular agreement  $z \in X$  be enforceable? The answer depends on the specific “punishment regime” that states expect to govern relations in the enforcement phase. Of many possibilities (Tit-for-Tat is a well-known example), for the rest of the article I will use the simple and severe “grim trigger” regime. In this strategy profile, if during the enforcement phase either player

33. Downs, Rocke, and Barsoom (1996) make a closely related point; see later discussion. For analyses of selection effects in international disputes, see Fearon 1994c, 1995.

is ever observed to have defected for any length of time, both then defect forever afterwards. This regime is employed purely for convenience—no substantive results depend critically on its choice.<sup>34</sup>

I show in the appendix that an agreement  $z \in X$  will be enforceable by trigger strategies when the following condition holds:

$$r\Delta \leq \min \left\{ \ln \frac{a + c_1}{a - z}, \ln \frac{a + c_2}{a - (1 - z)} \right\} \quad (1)$$

Loosely, this means that it is more likely that an agreement will be enforceable the longer the shadow of the future (that is, smaller  $r$ ); the better the technology for monitoring and response to violations (smaller detection lag  $\Delta$ ); the lower the short-run benefits of defection,  $a$ ; and the greater the costs of noncooperation,  $c_1$  and  $c_2$ .

These results are familiar and unsurprising. Greater interest attaches to the nature of the agreement,  $z$ , about which two points emerge. First, it is easily shown that the longer the shadow of the future (the smaller  $r$ ), the larger the set of enforceable agreements. Second, consider the case of two “equally powerful” states that have the same fixed costs for delay ( $c_1 = c_2$ ). Then condition (1) is more easily satisfied the more symmetric the agreement—that is, the closer  $z$  is to  $1/2$ . Asymmetric agreements are harder to enforce because the state getting the raw end of the deal is more tempted to renege. This temptation is less, of course, the greater the costs of noncooperation for this state (that is, the less powerful it is). Thus the less powerful a state is, the more it is willing to live with relatively asymmetric deals that disadvantage it, because the option of noncooperation is relatively worse.

For a given pair of feasible agreements  $x$  and  $y$ , condition (1) determines which of three cases is relevant, namely, whether both, one, or neither of the two agreements is enforceable in the second phase of the game. The case where neither agreement can be enforced has just been discussed; here, the states have no incentive to bargain seriously. Similarly, in the case where only one of the two agreements is enforceable, there is in effect nothing to bargain over. If the preferred deal of state  $i$  is the only enforceable one, in any efficient equilibrium state  $j$  will concede this immediately at time  $t = 0$ . Relative power may matter in this case, however. Greater power means lower costs for noncooperation, and condition (1) implies that the lower  $c_i$ , the less willing state  $i$  is to abide by an asymmetric agreement that disadvantages it. Thus the lower a state's costs for noncooperation, the more likely it is that only agreements favoring this state will be enforceable and so the subject of negotiations.

In the most interesting case, the shadow of the future is long enough that both cooperative agreements are enforceable. Here there is something to bargain over, namely the “prize” represented by the present value of the difference between the better and the worse deals,  $(x - y)/r$ . When both agreements are enforceable, the game

34. More precisely, the statement is true if we assume that players do not condition the nature of the punishment regime on what happens in the negotiating phase. I make this assumption for the rest of the article.

proves to have multiple subgame perfect equilibria.<sup>35</sup> Even so, all equilibria that involve some chance of delay in the bargaining phase have a common feature, described in the following proposition.

**PROPOSITION:** *Consider any subgame perfect equilibrium of the game in which (1) the agreement reached in the first phase (either  $x$  or  $y$ ) will be successfully enforced in the second phase; and (2) there is positive probability that the bargaining phase will last longer than time  $t = 0$ . In any such equilibrium, the probability that a state will concede in an instant of time  $dt$  conditional on having “stood firm” until time  $t > 0$  is constant and approximately equal to*

$$\frac{r(1 - x + c_2)}{x - y} dt$$

for state 1, and

$$\frac{r(y + c_1)}{x - y} dt$$

for state 2. Moreover, for small enough  $r$ , subgame perfect equilibria of this form exist.

*Proof:* See the appendix.

As in other complete information wars of attrition, this game has a family of equilibria involving a chance of delay before one side concedes the prize. These are “mixed strategy” equilibria, which may be interpreted as follows. Neither side knows exactly when the other side will quit, but in equilibrium each knows the probability distribution that describes the other side’s likely behavior. Holding out poses a trade-off. The longer one holds out, the greater the chance of receiving the prize, but at the same time the costs will be greater if the other side does not back down. In a mixed strategy equilibrium this trade-off is perfectly balanced—the states are always indifferent between conceding at time  $t$  and waiting any further length of time. This proves to imply equilibrium probability distributions in which the conditional probability that a state will quit in the next instant is constant.

Using some probability theory, the expressions in the proposition imply that in any equilibrium, if the dispute is not resolved immediately (at  $t = 0$ ), then the expected time until agreement is always

$$\bar{t} = \frac{x - y}{r[1 + c_1 + c_2 - (x - y)]}$$

35. This is true even given the restriction to trigger strategies in the second phase. For a full description of the set of equilibria in the classic (complete information) war of attrition, see Hendricks, Weiss, and Wilson 1988.

Notice that as  $r$  approaches 0,  $\bar{t}$  approaches infinity. Thus, *as the shadow of the future lengthens, both states choose tougher and tougher bargaining strategies on average, implying longer and longer delay till cooperation begins.*

The rationale behind this result is straightforward. When states care a lot about future payoffs, the expected long-run benefits of getting the better deal are very large [ $(x - y)/r$  approaches infinity as  $r$  approaches 0]. Thus the potential benefits of holding out increase. At the same time, when a state values future payoffs almost the same as current payoffs, conceding today is little better than conceding tomorrow—thus the costs of holding out are lower as well. With the benefits of holding out rising and the costs falling as the shadow of the future lengthens, equilibrium is maintained only if *both* states adopt tougher bargaining strategies, yielding more delay before agreement.<sup>36</sup>

This logic generalizes easily to another set of empirically relevant cases where the states expect to cooperate not indefinitely but rather for a finite amount of time. For example, arms control treaties, trade agreements, and agreements establishing international regimes are frequently expected to bind for the foreseeable future. By contrast, an agreement among central bankers to coordinate intervention to stabilize a currency has a clear object that will or will not be achieved within a certain length of time. Discount rates do not adequately capture the difference between these sorts of cases. With respect to the model, it is more like saying that there is a time  $T > 0$  at which point the gains from cooperating on this issue will disappear, and that this  $T$  can vary from small (the exchange-rate case) to very large (regimes rules, and so on). The preceding result generalizes to this case as follows: The smaller  $T$ , the more quickly will states reach agreement in the bargaining phase (on average).<sup>37</sup> Thus, if less time is available for states to take advantage of the gains from cooperation, it makes less sense to waste time holding out for a better deal. Likewise, the longer states expect today's agreement to be relevant in the future, the more reason they have to delay agreement by bargaining hard over distributional advantage.

### *An Incomplete-Information Version*

In the complete-information version of the game, the states know exactly how the other side values cooperative versus noncooperative outcomes. This is an implausibly strong assumption. In addition, many economic theorists have argued that uncertainty about another party's value for an agreement can cause inefficient delay in

36. Another implication of the mixed-strategy equilibrium given in the proposition is that the greater the difference in the two deals,  $x$  and  $y$ , the lesser the likelihood that states will concede at any given instant. When the two deals are close to identical ( $x \approx y$ ), the players place close to zero weight on holding out. Thus greater distributional conflict implies greater delay and more difficulty in reaching a mutually advantageous deal, as intuition suggests.

37. Of course, fixing a horizon in the present model would raise the issue of the "last-period effect" undermining cooperation altogether in the enforcement phase. Little substantive importance should be attached to this problem, however, since last-period effects in repeated Prisoners' Dilemma are not robust against small changes in the specification of the game, such as assuming that the date of the last period is not common knowledge (see, for example, Kreps, Milgrom, Wilson, and Roberts 1982).

bargaining.<sup>38</sup> For example, in bargaining on agricultural policy, a state may “hold out” in an effort to convince the other side that it has high costs for cooperation and so must be offered favorable terms if a deal is to be struck.

To consider the impact of incomplete information, suppose that the states know their own values for noncooperation ( $c_1$  and  $c_2$ ), but that they know only the distribution of their opponent’s value. To keep things manageably simple, I consider a symmetric case where the feasible agreements are  $x = 1$  and  $y = 0$ , and both states’ cost terms,  $c_1$  and  $c_2$ , are initially drawn from uniform distributions on the interval  $[1, 2]$ . Each state is informed of its own cost for noncooperation at the start of the game but not of its opponent’s.

A strategy in the bargaining phase now says how long a state will hold out as a function of its privately known cost  $c_i$  for noncooperation. In the appendix, I show that the following strategy forms a symmetric Bayesian equilibrium in the bargaining phase: If the state’s cost for noncooperation is  $c \in [1, 2]$ , the state holds out in the bargaining phase until time

$$t(c) = \frac{1}{r} \ln \frac{c}{2(c-1)}. \quad (2)$$

This expression implies that the lower a state’s cost for noncooperation, the longer it will hold out for the better deal. Thus “more powerful” types adopt tougher bargaining strategies and are more likely to prevail in the bargaining phase.<sup>39</sup> The catch is that ex ante, the states are uncertain about who is more powerful, in the sense of having lower opportunity costs for no agreement. Indeed, it is precisely this uncertainty that leads them to engage in a costly war of attrition. Willingness to hold out, bearing the costs of noncooperation, acts as a costly signal in the bargaining phase that credibly reveals a state’s “power” on the issue in question.

Expression (2) also shows that the main result for the complete information model holds up in the incomplete information case, namely that the expected delay before agreement increases as the shadow of the future lengthens. When states care more about future payoffs (that is, the discount rate  $r$  is smaller), all types choose tougher bargaining strategies. The ex ante expected time till agreement in this equilibrium is  $[(\ln 8) - 1]/r$ , or approximately  $1/r$ . Thus as the discount rate approaches zero, the expected time till agreement approaches infinity.

### *Bargaining with Many Possible Agreements*

Probably the most restrictive assumption made in these models is that there are only two feasible agreements. Although international bargaining about how to cooperate

38. See Kennan and Wilson 1993.

39. The derivative of  $t(c)$  is negative for costs  $c > 1$ , so that types with larger costs for delay quit sooner. This property holds in any Bayesian equilibrium of the game—incentive compatibility conditions imply that if  $c' < c$ , then type  $c'$  chooses a quit time at least as large as that chosen by type  $c$ . See Fudenberg and Tirole 1991, 216–17, for a proof in a standard war of attrition.

often takes the appearance of a war of attrition—two sides waiting for the other to back down—in principle states can usually offer compromise deals, attempts to “split the difference,” and so on. Would the main result in the preceding models hold up if such offers could be made? In particular, if the bargaining phase allowed for continuous offers, would a longer shadow of the future be associated with greater delay before agreement?

In its present condition, bargaining theory does not allow an unambiguous answer. In complete-information bargaining models that allow for continuous offers, agreement typically occurs immediately, independent of the discount rate.<sup>40</sup> With incomplete information, however, multiple equilibria usually exist that may or may not have the property observed in the attrition games. Recently, much interest in the theoretical literature on bargaining has been in the validity of the “Coase conjecture”—the proposition that as the costs of delay go to zero, trade will occur immediately between rational, though incompletely informed, bargainers.<sup>41</sup> (Note that this is the exact opposite of the result given earlier, based on an attrition game.) The Coase conjecture holds under some fairly restrictive conditions; namely, bargaining in which one side makes all the offers, only the receiver of the offers has private information, and it is common knowledge that there are gains from exchange. However, it may or may not hold in different equilibria of alternating offer games in which one or both sides has private information. In fact, in some equilibria the *opposite* of the Coase conjecture holds: As the discount rate approaches zero, the expected time till agreement approaches infinity.<sup>42</sup> Even when bargainers can “divide the pie” in an infinite number of ways, equilibria with attrition dynamics may exist. Tough types hold out longer than weak types, using delay to signal that they must be given a good deal. When the costs of delay are low, more delay is necessary to send the same signal. So although the option of dividing the “pie” in many ways may reduce the likelihood of costly standoffs with attrition dynamics, this possibility remains even with such “continuous offer” bargaining.<sup>43</sup>

## Empirical Implications

Received cooperation theory suggests that in domains where states have long shadows of the future and adequate monitoring capabilities, they should have little trouble

40. This is the result for the classic alternating-offer model of Rubinstein 1982. Motty Perry and Philip Reny (1993) have shown that if players are allowed to choose when and whether to make an offer, nontrivial delay may occur in subgame perfect equilibria if it takes time to react to offers.

41. Named for arguments in Coase 1972, the Coase conjecture should not be confused with the better known “Coase theorem.”

42. See Fudenberg and Tirole 1991, 422–23, especially note 34. For the result supporting the Coase conjecture, see Gul, Sonnenschein, and Wilson 1986. For contrary equilibria, see Bikhchandani 1992; and Cramton 1992.

43. The strongest results here are given by Abreu and Gul (1994), who show that if players are uncertain about each others’ bargaining strategies rather than about their valuations for the good or time, then, almost regardless of the specific bargaining protocol, all equilibria converge to one with attrition dynamics as the time between offers gets small.

arranging mutually beneficial international cooperation. Following the repeated Prisoners' Dilemma analogy, they need only agree to move to the "cooperate-cooperate" option and then enforce this with implicit threats of retaliation for defection. The theory predicts that we should observe new cooperation when something happens to reduce states' discount rates, increase monitoring abilities and information flows, or open up new benefits for coordination in an area where states' shadow of the future is long and monitoring is feasible.

When we distinguish between bargaining and enforcement phases and analyze them together, we obtain a more nuanced and rather different set of predictions.

First, in cases where effective monitoring is thought infeasible or the shadow of the future too short, state leaders will expect that no bargained agreement will be enforceable due to incentives to renege in the enforcement phase. Thus we should observe either (1) discussions about how to make monitoring and enforcement feasible; (2) nonserious bargaining, where states "commit" to vague agreements for various political purposes (in some instances they might make "framework agreements" to structure further discussions); or (3) no bargaining at all. Especially in the last case, a selection effect results. If we observe states bargaining seriously over the terms of cooperation in some issue area, they probably expect that monitoring and enforcement problems are not insuperable. And because the empirical literature on international cooperation typically samples cases by looking for serious bargaining, it may be biased against finding that concerns about renegeing and enforcement are important. George Downs, David Rocke, and Peter Barsboom make this point in a different way. They argue that in constructing international agreements states can choose the "depth" of cooperation, and that they will choose to go only as deep as they expect they can successfully enforce.<sup>44</sup>

To some extent we might avoid the selection-effect problem if we sample cases by issue area rather than by looking at serious efforts to construct agreements or the functioning of completed agreements. For example, if we examined the problem of arms control over a span of time rather than specific negotiations and agreements, we could ask, first, whether monitoring and enforcement concerns precluded serious negotiations and mutually beneficial "deeper" cooperation, and, second, how monitoring concerns compared to the bargaining problem as an obstacle over the whole period. Later I briefly sketch such an analysis for U.S.-Soviet arms control in the 1950s and 1960s.

The second prediction is that we should sometimes observe costly, noncooperative standoffs in precisely those circumstances where received cooperation theory would predict cooperation (that is, when the shadow of the future is long and there are potential mutual gains from agreement). Note that the theoretical results given earlier do not predict a long stalemate in every such case. Even in the war-of-attrition model, agreement will often be reached fairly quickly. For example, if success in the distributional struggle is 20 percent better than getting the worse deal ( $x = 1$ ,  $y = 0$ ,  $c_1 =$

44. Downs, Rocke, and Barsboom 1996.

$c_2 = 5$ ) and the states' leaders discount future payoffs by 10 percent each year, agreement will be reached within one year about 63 percent of the time in the most inefficient equilibrium of the game. In other, more efficient equilibria the average delay will be less.<sup>45</sup> Allowing for "continuous offer" bargaining, or for the fact that for some issues there may be salient "focal points," might make for quicker agreements still.<sup>46</sup> The prediction is not that a long shadow of the future will make for a costly standoff in every case, but only in some.

The results can be pushed further on this point—they yield comparative-statics predictions about the circumstances under which costly standoffs are more or less likely. First, and most intuitively, the greater the day-to-day opportunity cost of going without agreement, relative to size of the distributional stake at issue, the less the incentive to engage in a costly stalemate. Second, if the gains from cooperation will be available for a fixed amount of time (as in, say, coordinated intervention to stabilize exchange rates), the bargaining problem should be less problematic the shorter the time horizon for cooperation. Third, and most surprisingly from the perspective of existing theory, the bargaining problem should pose a greater obstacle the longer states' "shadow of the future."<sup>47</sup>

Lacking the space for an extensive empirical test, I will use this section to sharpen these general hypotheses and to give a preliminary assessment where possible. I consider each set of general predictions in turn, concentrating most on the first set.

Before beginning, I should stress that the mechanism identified here is clearly not the only reason that international bargaining over how to cooperate is sometimes protracted, contentious, and prone to failure. Other obstacles to agreement include the sheer complexity of many international issues (for example, in the Law of the Sea and the GATT negotiations), scientific and technical disagreements about the likely effects of different cooperative policies, and the time necessary to piece together domestic political coalitions in favor of a particular offer.<sup>48</sup> I focus here on the effects of the shadow of the future because of the interesting way in which it is predicted to effect both the enforcement and the bargaining problem, and because of its importance in the literature.

45. More efficient equilibria in the war of attrition involve one side conceding with positive probability at  $t = 0$ . See Hirshleifer and Riley 1992, 381ff.

46. See Garrett and Weingast 1993, who argue that policy "ideas" can make particular agreements focal; and Weber 1991, who analyzes three cases of U.S.-Soviet arms policy as repeated Prisoners' Dilemmas (antiballistic missile systems, MIRV warheads, and antisatellite weapons). I would argue that in each case Weber takes "focal point" resolutions of issues that might be resolved in many ways as the mutual cooperation outcomes in his Prisoners' Dilemmas.

47. The incomplete-information model also yields predictions about the influence of relative power. In brief, the more powerful state (the one with lower costs for noncooperation) gets its preferred outcome in bargaining, because it holds out longer. This supports Krasner's (1991) argument.

48. On complexity as a source of delay, see Winham 1977. On scientific and technical obstacles (which can interact in interesting ways with the bargaining problem; see Morrow 1994), see E. Haas 1990, P. Haas 1992. Domestic political obstacles to agreement are the subject of a large literature; for some examples, see Evans, Jacobson, and Putnam 1993.

*Bargaining Versus Enforcement Problems*

As argued, if we observe states attempting to craft an international agreement, the states' shadow of the future is probably not so short as to make cooperation infeasible due to fears of renegeing. Thus the model predicts that bargaining problems will often *appear* to be more salient obstacles to international cooperation than will monitoring and enforcement problems in observed cases of international negotiations.

This hypothesis seems supported by the extensive literature examining the run-ups to international agreements. In the first place, a number of authors note a relative absence of concerns about renegeing. Abram Chayes and Antonia Handler Chayes suggest that the "cooperation under anarchy" literature greatly overemphasizes the fear of deliberate cheating as an obstacle to existing international agreements. They state that "It is not conceivable that foreign ministries and government leaders could devote time and energy on the scale they do to preparing, drafting, negotiating, and monitoring treaty obligations unless there is an assumption that entering into a treaty commitment ought to and does constrain the state's own freedom of action and an expectation that the other parties to the agreement will feel similarly constrained."<sup>49</sup> In their analysis of macroeconomic coordination at the 1978 Bonn summit, Robert D. Putnam and Nicholas Bayne "find little evidence that the negotiations were hampered by mutual fear of renegeing," and argue more generally that "As a practical matter, it seems unlikely that the fear of intentional defection can explain all, or even most, of the unconsummated opportunities for mutually beneficial cooperation, particularly among Western nations."<sup>50</sup> Michael C. Webb argues that "The record of international macroeconomic adjustment policy coordination . . . suggests that the key issue in international negotiations has been determining how burdens of adjustment . . . will be distributed among countries, not overcoming obstacles to cooperation posed by the fear of cheating in an anarchic world."<sup>51</sup> Downs, Rocke, and Barsoom describe "the bedrock of the managerial school" as "the finding that state compliance with international agreements is generally quite good and that enforcement has played little or no role in achieving and maintaining that record."<sup>52</sup>

Second, numerous case studies find not only that major concerns about enforcement do not predominate in observed cases, but also that the question of "who backs down?" is often at least as or more difficult for states than "will the other side renege on the deal?" Studies of missed cooperation over arms, trade, and finance frequently find states failing to cooperate not because of problems arranging credible commitments but rather due to apparent "deadlock" in bargaining—the failure to find terms acceptable to both sides.<sup>53</sup>

49. Chayes and Chayes 1993, 186–87.

50. Putnam and Bayne 1989, 101, 102. See also Kenen 1989, 31.

51. Webb 1995, 46–47.

52. Downs, Rocke, and Barsoom 1996, 380, who also provide references to the "managerial school."

53. On arms control, see Evangelista 1990; and Downs, Rocke, and Siverson 1986. On trade, see Conybeare 1986; Grieco 1990; and Mastanduno 1991. On finance, see Oye 1986b; and Webb 1995. Citing Harrison Wagner, Oye (1986a, 7) offers the general caution, "When you observe conflict, think Deadlock—the absence of mutual interest—before puzzling over why a mutual interest was not realized." (It is

Analysts have responded to such results in two ways, saying either that there must not have been any mutual benefits at issue (“Deadlock”) or that “relative-gains problems” explain the missed opportunities. The former explanation may be valid in some cases, but the possibility of bargaining delay—states rejecting current offers in hopes of getting a better deal in the future—needs to be considered. The case evidence given in these studies suggests both that nonagreement entailed costs for the states involved (implying a likelihood of some mutual interest), and that bargaining hard for relative advantage played a major role in making cooperation more difficult.<sup>54</sup>

This is equally true of case studies that explain noncooperation by reference to the “relative-gains problem.” A relative-gains problem exists if, for all divisions of a flow of benefits from mutual cooperation, at least one state prefers not to cooperate for the following reason: the state fears that its short-run gains will be outweighed by long-run losses due to future economic or military actions by the other state, which is anticipated to grow stronger due to “relative gains” from the original agreement. Demonstrating that negotiations stalemate due to relative-gains fears rather than a bargaining problem entails showing that at least one state’s leaders feared that a specific distributional disadvantage would translate in the future into military danger or state-led economic extortion. Correctly understood, the “relative-gains problem” is a problem of credible commitment rather than a bargaining problem—the inefficiency arises from states’ inability to commit not to take advantage of greater relative power in the future.<sup>55</sup>

While Joseph Grieco and Michael Mastanduno have shown the United States, the EC, and Japan all bargaining hard for relative advantage in trade deals, the evidence that this was motivated primarily by fears that the other side might use its “relative gains” for military threats or economic extortion is slim, particularly in Grieco’s case of U.S.-EC nontariff barrier negotiations and implementation.<sup>56</sup> Grieco seems to accept that military considerations were not at issue in his cases, and for his evidence Mastanduno says explicitly that “The immediate concern was not military security, but economic well-being.”<sup>57</sup> Concerning economic well-being, both authors effectively count any evidence of worries about differential economic growth as confirming the relative-gains hypothesis. But such worries should count only if leaders fear future economic coercion and extortion by the partner-adversary, rather than if they are simply worried about the long-run (absolute) welfare of their countries’ high-technology firms in industries marked by increasing returns to scale. If cooperation fails on the latter account, this is not a case of a relative-gains problem, but rather a more simple matter of bargaining for relative advantage within a deal.

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worth noting that if there really is no mutual interest in “cooperation,” then “conflict” is actually a good thing from a normative standpoint.)

54. I reconsider Evangelista’s case along these lines later.

55. This point is further developed in the conclusion.

56. See Grieco 1990; and Mastanduno 1991. For this criticism, see also Keohane 1993, 280–83; Snidal 1991, 723n1; and especially Liberman 1996, 155–58.

57. See Grieco 1993, 316, 325; and Mastanduno 1991, 109.

Finally, case studies of international negotiations that ultimately *did* yield successful agreement frequently find state agents concentrating far more on bargaining problems than on enforcement and monitoring issues. To give some examples from trade,<sup>58</sup> the major obstacles to the conclusion of each of the last three GATT rounds were not intractable problems of monitoring, commitment, enforcement, or information flows to make enforcement possible. Instead, negotiations have regularly stalemated on questions of who would make the concessions necessary to conclude an agreement. Deadlines declared by the negotiators have been largely useless for eliciting “bottom-line” offers. The key concessions yielding agreement in the Kennedy Round were made only on the eve of a more credible deadline—the expiration of the U.S. executive’s negotiating authority granted by Congress. John W. Evans observes that

It was . . . no coincidence that the apparent settlement in May [1967] came at so nearly the last possible minute. . . . [T]he American negotiators had reason to put off a final compromise until they were certain that no further concessions could be extracted from others, especially the EEC [European Economic Community]. As for other negotiators, the conviction that the United States could not afford to let the Kennedy Round fail must have encouraged the belief that the American negotiators would finally be forced . . . to increase their own concessions. . . . In the days just before May 15, however, any hope that the Community or others may have had of exploiting the American need for a successful Kennedy Round must have faded. The failure of the U.S. administration to ask for an extension of the Trade Expansion Act authority may have provided the most convincing evidence.<sup>59</sup>

Evans concludes that the effect of delay in multilateral trade negotiations is to increase the political costs to any one state for appearing to be the cause of failure, and that such delay is necessary to gain agreements.<sup>60</sup>

In the Uruguay Round, even this U.S. Congress-imposed deadline was (thrice) let pass, as the United States and the EC waited and pushed for the other to back down or back off on the issue of agricultural subsidies. The Omnibus Trade and Competitiveness Act of 1988 expired in December 1990, just after talks on agriculture failed “spectacularly” in Brussels.<sup>61</sup> The Bush administration won an extension of negotiating authority in May 1991 to June 1993; this deadline again passed without agreement.<sup>62</sup> Consistent with the theoretical argument made earlier, it is the very fact that states expect to be bound by a GATT agreement (that is, that it will be largely enforceable) that gives them an incentive to bargain so hard over the precise terms.

58. For examples concerning telecommunications, see Krasner 1991.

59. Evans 1971, 276–77.

60. See also Preeg 1970, 74–76, 139–43, 146–50, chap. 11, esp. 189ff., 260–62; and Paarlberg 1997, 423, who observes that “serious bargaining in GATT does not begin to replace posturing until several years into the round.” The “audience cost” mechanism described by Evans operates in other international bargaining contexts as well, such as international crises; see Fearon 1994a.

61. See Winham 1992, 73–74 (who termed the failure spectacular); and Destler 1992, 134–35.

62. *The Economist*, “Better Barter,” 23 May 1993, 76. The 1990 deadline was perhaps less credible than that for the Kennedy Round; the 1988 act allowed for a two-year extension of fast-track authority, provided that no disapproval motion passed in Congress.

Which is the more significant obstacle to beneficial international agreements, bargaining problems or concerns about enforcement and reneging? The selection effect implies that case evidence like that just considered cannot provide an answer (though it can provide evidence about the salience of bargaining problems). As the equilibrium results given earlier suggest, by sampling on negotiations we may be missing cases where no serious bargaining occurs because both sides expect that all mutually beneficial deals would be unenforceable. Further, as Downs, Rocke, and Barsoom argue, the selection effect can operate even in the set of *observed* international agreements, since if states can choose the depth of cooperation on an issue, they will choose to go only as deep as they expect they can enforce.

To some degree, these problems can be addressed by (1) sampling on issue areas rather than negotiations or agreements, and (2) asking whether the state leaders in question believe that they are forgoing substantial benefits because of the enforcement problem and are seeking ways to improve monitoring and enforcement in order to gain greater cooperation (and thus welfare). On the latter point, note that if Downs, Rocke, and Barsoom are correct in their claim that “deep” cooperation—which, by hypothesis, would make all parties *much* better off—is rare due to the enforcement problem, we would expect state leaders to be very unhappy about this. They should recognize the (prisoners’) dilemma they face and be actively engaged in seeking ways to resolve or ameliorate the enforcement problem that traps them in a bad collective outcome relative to what is ideally possible. In making their empirical case, Downs, Rocke and Barsoom argue that U.S.-Soviet arms control agreements did not dramatically alter the course of either side’s arms policies, which is consistent with the claim that the superpowers achieved at best “shallow” cooperation. However, they do not argue or establish that U.S. and Soviet leaders saw themselves as forced to forgo highly beneficial “deep” cooperation due to the enforcement problem. I next consider the arms control issue area in the 1950s and 1960s, suggesting that although some evidence supports the view that monitoring and enforcement problems precluded deeper cooperation, the more significant obstacle in this instance was a bargaining problem that rendered moot the issue of gaining “deep” cooperation by better enforcement.

If an enforcement problem plagued arms control in the early Cold War, this probably had to do with monitoring difficulties rather than a short shadow of the future. For most of the Cold War, the shadow of the future was arguably long for both sides’ leaderships. Until the later Mikhail Gorbachev years, neither U.S. nor Soviet leaders showed any great concern that the other side was too impatient or politically volatile to be trusted to stick to deals, and both sides surely expected a high probability of continued interactions. Monitoring, by contrast, would at first glance appear to have posed significant barriers to cooperation, especially in the 1950s. The Soviets rejected the idea of on-site inspections, and without this both the Harry Truman and Dwight Eisenhower administrations argued that disarmament and arms control proposals were unenforceable and thus dangerous.<sup>63</sup> It is worth noting that Soviet objec-

63. See, for example, Bundy 1988, 164, 297–98; and Evangelista 1990, 514–15.

tions to on-site inspections themselves stemmed from a political commitment (or enforcement) problem—the Soviets did not trust U.S. assurances that inspections would not be used for spying. Nikita Khrushchev put it nicely to Averell Harriman, when Harriman denied that the United States would use inspections for espionage: “You’re trying to tell me that if there’s a piece of cheese in the room and a mouse comes into the room that the mouse won’t go and take the cheese. You can’t stop the mouse from going for the cheese.”<sup>64</sup>

As the model suggests when monitoring is thought infeasible, what arms control bargaining took place in the 1950s was not serious, especially on the U.S. side. John Foster Dulles in particular was more interested in using arms control bargaining to win the public opinion or propaganda battle than in gaining agreements on arms.<sup>65</sup> Consistent with the argument about selection effects, when serious bargaining finally did occur in the early 1960s, it focused on an issue for which the monitoring issues were resolvable given the technology of the time. One element of the appeal of the 1963 Limited Test Ban Treaty was that it was straightforwardly self-enforcing. Each state could easily determine if the other had resumed atmospheric testing and then reply in kind if necessary.<sup>66</sup>

Similarly, the development of satellite reconnaissance technology in the early 1960s solved monitoring problems that made it possible to bargain in SALT I over limiting antiballistic missile (ABM) systems and new offensive missile deployments. Still unwilling to grant U.S. inspectors ground access, the Soviets were willing to allow verification by “national technical means,” as the euphemism used in the 1972 treaty put it.<sup>67</sup> Although questions of whether compliance could be adequately monitored did arise (particularly in the U.S. Senate and Joint Chiefs of Staff<sup>68</sup>), it would be hard to argue that enforcement issues posed the major obstacle to getting a SALT I agreement. Instead, as the model would predict for a case of high discount factors and adequate monitoring capabilities, questions of who would back down on specific demands concerning the number and placement of ABM systems, and more impor-

64. Cited in Seaborg 1981, 241.

65. See Bundy 1988, 296–302; and Evangelista 1990, 520–21.

66. By July 1963, when serious work on the limited test ban began, the United States and the Soviet Union had been bargaining over a comprehensive test ban treaty for six years. The major sticking points were the number of on-site inspections the Soviets would allow and the way these inspections would be conducted. Although the limited test ban treaty was perceived as “half a loaf” by Kennedy and probably by Khrushchev, what made it feasible was that it did not require the on-site monitoring that the Soviets rejected and U.S. senators demanded for a comprehensive ban. See Seaborg 1981, 240–42; and Bunn 1992, chap. 2.

67. Gaddis concludes that “virtually none of the limited progress the two countries have made in the field of arms control would have been possible had Americans and Russians not tacitly agreed to the use of reconnaissance satellites and other surveillance techniques to monitor compliance” (1987, 233). James A. Schear (1989, 275) suggests that technological advances in the monitoring capabilities “played a crucial role” in laying the groundwork for the SALT I negotiations. See also Bunn 1992, 107; Garthoff 1977, 16; and Newhouse 1973, 70–71, 174.

68. See Newhouse 1973, 162. As in the 1950s, U.S. military objections to SALT I on the grounds of monitoring problems were often just acceptable cover for not liking the terms of the deal.

tantly over which missiles would be counted and to what relative levels, were the principal obstacles to concluding the agreement.<sup>69</sup>

Thus, for the period before satellite reconnaissance, there is some evidence that perceived monitoring difficulties did prevent serious bargaining over cooperation and may have also limited the “depth” of what cooperation occurred. But this short account overstates the importance of monitoring issues as obstacles to U.S.-Soviet arms control agreements, especially for the 1950s. Several authors have argued that for important figures in the Eisenhower administration concerns about monitoring were significant but not crucial. Matthew Evangelista concludes that although in the 1950s most U.S. officials were skeptical about the prospects for verification, “they believed, in any case, that U.S. security would be better served by an arms buildup.”<sup>70</sup> Dulles, for example, supported the “Open Skies” proposal made at the 1955 Geneva summit not because its acceptance would make “deeper” arms agreements possible by improving monitoring capabilities. Instead, Dulles saw it as a way to divert public and ally pressures for arms control while the U.S. pursued an arms race in which it was doing well.<sup>71</sup>

Evangelista concludes that U.S. officials in the 1950s had “Deadlock” preferences concerning the arms race: “Most American officials evidently preferred the risk of an unconstrained arms race to any conceivable agreement that could be reached with the USSR.”<sup>72</sup> If attention is restricted to these specific arms negotiations it may be reasonable to characterize them as “Deadlock.” The theory sketched earlier suggests what may be a more fruitful interpretation, however, which embeds the arms negotiations in a larger context of Cold War bargaining. In this larger context, Eisenhower and Dulles did not think of the Cold War in terms of “Deadlock” but rather as a costly standoff or war of attrition. They certainly perceived the arms race as costly, but they also believed that the United States could hold out in the broader Cold War bargaining game longer than the Soviets could, and that this would yield a future outcome worth waiting for. As Dulles put it in a remarkable memo written in June 1955, “The Soviet Bloc economy cannot indefinitely sustain the effort to match our military output. . . . The greater military potential of the United States . . . gives the United States its maximum bargaining power and this is a power which should not be cheaply relinquished.”<sup>73</sup> This is a clear statement of war-of-attrition reasoning—Dulles argues in favor of “holding out” despite the costs of arms racing because he thinks the Soviets will have to “back down” first, and the diplomatic and strategic benefits will be worth the costs in the end.<sup>74</sup>

69. For good treatments of the bargaining, see Newhouse 1973; and Garthoff 1985.

70. Evangelista 1990, 514.

71. Bundy 1988, 298–301.

72. Evangelista 1990, 514.

73. Cited in Bundy 1988, 299.

74. Evangelista agrees that Eisenhower and Dulles viewed arms racing as costly but argues that the Joint Chiefs of Staff did not due to their institutional interests; Evangelista 1990, 524. Further, he maintains that they had “veto power” and could block concessionary policies by Eisenhower; *ibid.*, 527. Although the Joint Chiefs’ preferences certainly influenced Eisenhower, they are not formally empowered to veto presidential initiatives. They can, however, testify before Congress, which in particular circumstances may

The U.S.-Soviet arms race was a long-lived, costly standoff that is anomalous for received cooperation theory but not for the theory advanced here. As Evangelista suggests, the shadow of the future extended a long way for these two superpowers; so if the race were appropriately conceived as a repeated Prisoners' Dilemma, we would predict that "Both sides would have had an incentive to strengthen measures of verification and move toward cooperation rather than continue to compete indefinitely in a series of mutual defections."<sup>75</sup> Instead, cooperation was rejected. This may not have been because there was no mutual interest in ending the costly arms race but rather because of a bargaining problem—*on what terms* would the race be ended?

### *Costly Stalemates and Comparative Statics*

The preceding section argued that at least one important case of international noncooperation—the early Cold War arms competition—might be usefully understood in terms of the model developed here. Though often described this way, the competition was not simply "like" a repeated Prisoners' Dilemma where the problem is to achieve cooperation despite incentives to renege. Rather, its dynamics turned crucially on the distributional problem of how or on what terms any mutually beneficial cooperation (an end to the arms race) might take place, a problem that must be resolved before enforcement and monitoring of a deal can begin. Consistent with the model's results, we observe a costly standoff in a case where both sides saw much at stake in the distributional conflict and (arguably) had a long shadow of the future.

Finding other cases of costly standoffs that have a war-of-attrition aspect is not difficult; for example border disputes in which two states incur the costs of arming or poor relations as they "stand firm" on the question of precisely where the border lies or who has sovereignty over which small island. The long-standing Russian-Japanese dispute over ownership of the Kuriles is a case in point, where the mutual costs have been investment, trade, and aid opportunities forgone, along with generally poor diplomatic relations.<sup>76</sup> Similarly, protracted civil wars, which are tragically common, can pose a puzzle for received cooperation theory.<sup>77</sup> There are clearly mutual gains to be had if the warring factions can agree on a constitution to regulate the political and economic life of the country they inhabit. Given that the shadow of the future is likely to be long due to the frequency and expected duration of interaction among the inhabitants of the territory, why do they not move straight away to the "cooperate-cooperate" option of common government and constitution? Although the problem of arranging credible commitments to observe a constitutional settlement's terms is indeed crucial,<sup>78</sup> the mechanism described here may sometimes be

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give them an effective veto. If, in this instance, Eisenhower could not have prevailed over them, had he wanted to, then war-of-attrition bargaining was arguably a sufficient but not necessary cause of the policy.

75. Evangelista 1990, 523. Note that this point applies equally to Downs, Rocke, and Barsom's analysis.

76. See Goodby, Ivanov, and Shimotamai 1995.

77. For data, see Licklider 1995; and Walter 1997.

78. See Fearon 1994b; and Walter 1997. Cooperation theory's Tit-for-Tat mechanism may be inapplicable in this context because a single "defection" by the faction that gains power can eliminate or perma-

relevant as well. Warring factions invariably have conflicting preferences over the terms of a settlement and may hold out for better terms for a long time in a (literal) war of attrition.

Insofar as such cases can be anomalous for received cooperation theory but explicable when we bring the bargaining problem in, this is a success for the theory. Nonetheless, we would like to go beyond this to test for the specific and perhaps counterintuitive dynamic predicted by the war-of-attrition model—that costly stand-offs are more likely to occur in cases where state leaderships discount future payoffs relatively little.

To do so, we need to be able to interpret and measure leaders' discount rates empirically, a difficult task since the number of factors that might influence a leadership's value for present versus future benefits is large. Although the personal time preferences of leaders (that is, their impatience) probably explain little variation across states, discounting due to government instability, elections, random domestic political pressures for renegeing, and random fluctuations in matters affecting the value of a particular agreement can all vary, whether across states, issue areas, or even specific issues subject to international bargaining.<sup>79</sup> Since all or several of these factors can operate in any specific case, comparing discount rates across cases is problematic. Further, since other things besides discount rates influence the probability of a costly standoff (even in the simple model considered earlier), any systematic effect of discount rates is unlikely to be observed in a small-*N* study.

Given these problems, the best I can do here is to make broad comparisons using a rough measure—states' expectations about the likely *duration* of an agreement, should an agreement be reached. If the parties expect that an agreement would be likely to govern relations for a long time to come, the parties must not expect exogenous random shocks of various sorts to lead to the termination of the arrangement—thus discounting is probably low. By contrast, if the parties expect that an agreement will probably be short-term because circumstances are likely to change so as to render the agreement irrelevant or unprofitable, their shadow of the future is probably relatively short.

For example, territorial settlements negotiated outside of war are typically expected to be obligatory and observed for a very long time. As noted earlier, for such cases we often observe long, costly stalemates with no agreement. The case of civil wars is similar. The factions involved in civil war know that the premise of a constitutional settlement is that it will govern relations for a long, possibly indefinite period. The model's prediction, then, is that conditional on civil war occurring, pro-

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nently weaken opponents, rendering conditional retaliation ineffective for the policing of power-sharing agreements. Thus a commitment problem can make the object of contention (state power) effectively indivisible and so a prime candidate for war-of-attrition bargaining.

79. Simmons successfully uses measures of government instability to proxy for state discount rates in her study of interwar monetary cooperation, though she "recognize[s] that domestic time horizon is only likely to account for a small part of the overall variance in a cooperative outcome, since a large proportion of cases will surely be stable ones, and stable governments will nevertheless vary greatly in their willingness and ability to cooperate" (1994, 286n9).

tracted, costly standoffs should often be observed, which is consistent with empirical work on the subject.<sup>80</sup>

At the other end of the spectrum, states negotiate short-term international agreements regarding specific “issues of the day” all the time—agreements to intervene collectively in exchange markets, to intervene with military forces in peace-keeping missions, to coordinate public declarations regarding a hostage crisis, and so on. Such agreements, as in the monetary example, frequently oblige the continuous or repeated choices of cooperative actions by the states involved, even if the total duration of cooperation is not expected to be long. Further, states almost invariably face distributional conflicts in bargaining to such agreements. When agreement duration is expected to be short because of likely exogenous shocks, discount rates are low and the prediction is for quick settlement in the bargaining phase. When duration is expected to be short because some specific task is being accomplished (such as exchange-rate stabilization), incentives to stand firm in the bargaining phase are low also. In both cases, the theoretical prediction accords with what is typically observed—a relatively brief bargaining phase so that cooperation can begin while there are still expected benefits to be had.

The international agreements most studied by international political economy scholars—trade, arms, and environmental treaties or regimes—generally fall in between these extremes in terms of state expectations about likely duration. I will not hazard strong generalizations about typical discount rates in these cases, except to say that one might expect the bargaining problem to be worse when states are negotiating over the construction of a *regime* with significant distributional implications (like European monetary union, for instance) as opposed to specific agreements within a regime. Insofar as a regime is expected to govern relations for a long time, the states’ distributional stakes are raised at the outset. If this is correct, then, paradoxically, the “stronger” states expect a regime to be, the more difficult it may be for them to reach agreement on its construction.

Counteracting this effect, however, is the fact that negotiations over regime construction typically involve more than two parties. So far I have said nothing about how the theoretical argument extends to problems of international cooperation negotiated and enforced in a multilateral setting. In multilateral bargaining (over, say, regime rules), there can be a new cost associated with holding out for a better deal—the risk that the other parties will cut their own deal, excluding the recalcitrant state. This risk acts very much like a discount rate, since a state’s expected future benefits for delay have to be discounted by the probability of exclusion.<sup>81</sup> The theoretical argument made earlier would then suggest that, other things equal, the risk of exclusion in multilateral bargaining will constrain states’ ability to engage in costly stand-

80. Empirical evidence on the intractability of civil conflicts is summarized in Walter 1997; see also Licklider 1995. As noted earlier, commitment problems can contribute to the problem by making political power hard to divide.

81. See, for example, Baron and Ferejohn’s (1989) model of multilateral bargaining in a legislature, where the risk of being excluded from the winning coalition in the next period acts much like a discount factor in leading legislators to accept current proposals.

offs, or at least for states not essential to any agreement. For example, Geoffrey Garrett observes that in the bargaining over the Single European Act, “Threats by France and Germany to create some sort of free trade area between themselves were highly credible, and Mitterand and Helmut Kohl consistently raised this prospect when negotiations with Britain became bogged down.”<sup>82</sup> This factor works in the opposite direction from the effect of the relative permanence of regime rules; so here I can only note the existence of these two potentially off-setting mechanisms.

## Conclusion

Problems of international cooperation have a common strategic structure. Before states can implement, monitor, and enforce an international agreement, they must bargain to decide which of many possible agreements to implement. This simple point is obscured or misunderstood by the theoretical apparatus of cooperation theory and its critics. Received theory suggests that some problems of international cooperation are about coordination, whereas others are about monitoring and enforcement, or that in general one of these two options dominates.<sup>83</sup> The model proposed here more accurately and simply depicts the problem of international cooperation as states face it and yields some interesting theoretical implications as well. For example, posing the problem as “bargaining first, then enforcement” leads us to see that bargaining and enforcement problems may interact in a way that cuts against the standard argument about cooperation and the shadow of the future. The more states value future benefits, the greater the incentive to bargain hard for a good deal, possibly fostering costly standoffs that impede cooperation.

I conclude with a clarifying comment on the relationship between bargaining and relative-gains problems and a brief statement of implications for understanding international regimes.

### *Bargaining Versus Relative Gains*

Since Grieco’s influential framing of the problem in “Anarchy and the Limits of Cooperation,” scholars have distinguished and argued the relative importance of two obstacles to international agreements—problems of monitoring, enforcement, and credible commitment to uphold a deal, and the “relative-gains problem.”<sup>84</sup> This article has suggested that the bargaining problem represents a third important obstacle, distinct from the other two. Because relative-gains and bargaining problems are sometimes conflated, I should clarify how they differ.

A relative-gains problem blocks mutually advantageous international cooperation if two conditions are met. First, the states involved are unable to commit not to use

82. Garrett 1992, 547, who is citing Moravcsik 1991, 38. For more general theoretical arguments that turn on closely related mechanisms, see Gruber 1996; and Snidal 1996.

83. Some influential examples include Keohane 1984; Krasner 1991; Snidal 1985; and Stein 1982.

84. Grieco 1988. For studies of both problems and the debate, see Baldwin 1993.

relative gains accruing from an agreement to extort or extract further gains in the future. Properly understood, then, the relative-gains problem is a Prisoners' Dilemma-like problem of credible commitment, of the same family as those stressed by the cooperation theorists. It belongs, however, to a species of Prisoners' Dilemma-like problems that are not resolvable by the "Tit-for-Tat" mechanisms of conditional retaliation. In situations where today's interaction changes relative-bargaining power tomorrow, Tit-for-Tat strategies can be insufficient to gain cooperation, because retaliatory actions may be rendered ineffective in the future due to today's shift in bargaining power.<sup>85</sup>

Second, for a relative-gains problem to block cooperation, the states must be unable to divide the gains so that current relative-bargaining power will be preserved in the future. Although this condition is crucial, advocates of the relative-gains argument have not explained why or under what conditions it should be expected to hold.<sup>86</sup> If the answer is that the bargaining problem—distributional conflict over the terms of agreement—may prevent this, it seems that relative-gains problems *require* a bargaining problem to operate at all. An alternative possibility is that if the states are quite risk averse and are also uncertain about future relative gains resulting from any agreement, in principle states might prefer the noncooperative status quo to all divisions of expected relative gains.<sup>87</sup>

The bargaining and relative-gains problems are thus distinct. The latter should be understood as a problem of credible commitment (or anarchy) that may require, in addition, a bargaining problem to operate at all.

### *Bargaining Problems and International Regimes*

Conceiving of problems of international cooperation primarily as analogous to repeated Prisoners' Dilemma games, cooperation theory understands international regimes primarily as institutional solutions to problems of monitoring and enforcement. Thus, in *After Hegemony*, Robert O. Keohane argued that states may create and maintain regimes because they increase information flows about state behavior and so facilitate monitoring and establishing valuable reputations.<sup>88</sup> Likewise, the explicit norms, principles, and rules that mark international regimes are argued to foster a common understanding about what actions constitute "defection," thus making the recognition of defection easier and possibly aiding the coordination of punishment strategies.<sup>89</sup> Finally, Keohane argued that by bundling issues together and regu-

85. For formal analyses of several settings where this sort of commitment problem appears, see Fearon 1994b, 1995, 1997; and Powell 1991.

86. Snidal 1991, 703, makes this point; see also Liberman 1996. In response, Grieco (1993, 321) simply asserts that "In the real world states can and sometimes do receive unequal gains," and that it is "implausible" to suppose that states might "as a matter of course" resolve relative-gains concerns by bargaining.

87. Snidal (1991, 723n3) seems to allude to this possibility and notes that it is not systematically developed in the relative-gains literature.

88. See Keohane 1984, chap. 6; and Keohane and Axelrod 1985.

89. Keohane 1984, 94, 106.

larizing interstate interactions over them, regimes may increase the shadow of the future and so raise the costs of being punished in the repeated Prisoners' Dilemma.<sup>90</sup>

To be fair, Keohane also suggested that states may construct and maintain regimes because these can lower "transaction costs," a large category that includes some costs related to bargaining. He argues that regimes "cluster" issues together, which facilitates side payments and issue linkages, in turn aiding in "the construction of mutually beneficial bargains."<sup>91</sup> Thus regimes might lower the likelihood of costly stalemates by increasing the ease of splitting the difference.

In line with the arguments presented earlier, I would suggest that regimes deserve greater attention as *forums for bargaining* rather than primarily as institutions that aid monitoring and enforcement.<sup>92</sup> Interstate bargaining increasingly takes place in the context of international regimes created by states. How do these regimes ease (or exacerbate) the problem of distributional conflict over the terms of interstate agreements?

Beyond Keohane's idea about side payments and issue linkage, the preceding analysis suggests three mechanisms. First, focal points and bargaining precedents are undoubtedly created by the experience of repeatedly negotiating certain sets of issues within the context of a regime. This is probably true of any repeated bargaining situation, but compare bargaining within a regime with ad hoc, possibly bilateral bargaining that takes place in no larger framework. Almost surely, both the propensity to create focal principles and the force of such principles will be greater in the case of explicit regimes. Regimes establish connections and parallels between different rounds of bargaining and may legitimize focal principles because regimes bear legitimacy as the concrete products of visions of world order. And, as Schelling argued, focal points and principles can be decisive in the resolution of distributional conflict in bargaining.<sup>93</sup>

Second, regimes put explicit structure on interstate bargaining processes; they may specify who can make what sort of offers, when, in what sequence, to whom, and so on. Keohane and others have already observed that such rules might facilitate complex bargaining in multilateral contexts. But bargaining theory suggests other influences as well. The institutions that structure bargaining can affect distributional outcomes and the probability of stalemate or "no agreement."<sup>94</sup>

Third, regimes may lessen the bargaining problem by raising the political costs of failure to agree, since a failure to agree can now have adverse implications for the regime. The examples from GATT rounds, discussed earlier, are emblematic here. As Evans argued, the effect of delay in GATT negotiations was to increase the political costs to any one state for appearing to cause a breakdown.<sup>95</sup> Beyond the Kennedy Round that Evans analyzed, impasse in GATT rounds has regularly been accompa-

90. Keohane 1984, 89–90, 103–107.

91. Keohane 1984, 91.

92. See also Morrow 1994, 408–11, for this view.

93. Schelling 1960.

94. See, for example, concerning the European Union, Garrett 1992; and Tsebelis 1994.

95. Evans 1971, 276–77.

nied by dire warnings in the business press about the possibility of a “collapse” of the whole trade regime. Although these warnings were no doubt exaggerations, they are indicative of how the existence of a formal, named, and highly articulated trade regime raised the costs of bargaining failure within the regime. Similar pressures for settlement were associated with the SALT talks, which were likewise played as drama for domestic political audiences.

### Appendix

DERIVATION OF CONDITION (1). Suppose the enforcement phase begins at time  $T$ , with  $(z, 1 - z)$  as the per-unit-time payoffs for mutual cooperation. Consider the following strategies for the subgame beginning at  $T$ : Each state cooperates for times  $t \in [T, T + \Delta)$ , and at all  $t \geq T + \Delta$  provided that both states cooperated at all  $t' \in [T, t - \Delta)$ . If either state is ever observed to have deviated (say, at time  $t' \geq t$ ), then both states defect at all times  $t \geq t' + \Delta$  regardless of play after  $t'$ .

These trigger strategies will form a subgame perfect equilibrium in the subgame beginning at  $T$  if neither state has an incentive to deviate after any history following  $T$ . Abiding by these strategies yields a payoff of  $z/r$  for state 1 and  $(1 - z)/r$  for state 2 (as assessed from time  $t \geq T$ ). By deviating at time  $t \geq T$ , state 1 receives at most

$$\int_0^\Delta ae^{-rs} ds - \int_\Delta^\infty c_1e^{-rs} ds = \frac{1}{r} [a(1 - e^{-r\Delta}) - c_1e^{-r\Delta}],$$

assessed from time  $t$  on. Thus the condition for state 1 to be willing to abide by the equilibrium strategy is

$$\frac{z}{r} \geq \frac{1}{r} [a(1 - e^{-r\Delta}) - c_1e^{-r\Delta}],$$

or

$$r\Delta \leq \ln \frac{a + c_1}{a - z}.$$

A symmetric calculation establishes the relevant minimum  $r \Delta$  for state 2 to be willing to stick with the equilibrium strategy.

PROOF OF THE PROPOSITION. The bargaining phase of the game can be redescribed as a standard complete-information war of attrition studied by John Maynard Smith, John Riley, and others.<sup>96</sup> In the present case, the prize  $V$  is the discounted value of the difference between the better and worse deals,  $(x - y)/r$ , while the per-unit-time cost of delay is the difference

96. See, for examples, Maynard Smith 1982; Fudenberg and Tirole 1991; and Hendricks, Weiss, and Wilson 1988.

between the worse deal and the state's value for noncooperation—that is,  $y - (-c_1) = y + c_1$  for state 1, and  $1 - x - (-c_2) = 1 - x + c_2$  for state 2. As Hirshleifer and Riley show, any equilibrium in which delay may occur involves both sides choosing mixed strategies such that each is indifferent between quitting at every time  $t$  and delaying for another instant of time  $dt$ .<sup>97</sup> This implies that the marginal benefit of delaying for the instant  $dt$  must equal the marginal cost. Let  $F_2(t)$  be the cumulative distribution describing a mixed strategy for state 2. The marginal benefit of delay for state 1 is

$$\frac{F_2(t + dt) - F_2(t)}{1 - F_2(t)} \frac{x - y}{r},$$

where the first term is the conditional probability that state 2 will quit in the next instant, and the second term is the value of the prize. The marginal cost of delay for state 1 is  $(y + c_1)dt$ . Thus in any mixed equilibrium we have

$$\frac{F_2(t + dt) - F_2(t)}{1 - F_2(t)} \frac{x - y}{r} = (y + c_1)dt.$$

Rearranging and taking limits yields

$$\frac{f_2(t)}{1 - F_2(t)} = \frac{r(y + c_1)}{x - y},$$

where  $f_2(t)$  is the density function for  $F_2(t)$ . This is the condition given in the proposition. Similar logic applies for the hazard rate of quitting for state 1. Q.E.D.

EQUILIBRIUM WITH INCOMPLETE INFORMATION. I will first show that the strategy  $t(c)$  given in the text forms a symmetric Bayesian Nash equilibrium in the bargaining phase treated as a game by itself. I will next discuss the extension to the whole (two-phase) game.

The strategy

$$t(c) = \frac{1}{r} \ln \frac{c}{2(c - 1)}$$

is strictly decreasing for  $c \in [1, 2]$ , and so has an inverse  $c(t)$ , which gives the type  $c$  of a player that chooses to quit at time  $t$  in the proposed equilibrium. By time  $t$ , all types of each player with  $c \in [c(t), 2]$  will have quit, if both states are following the strategy  $t(c)$ . Since, for each state,  $c$  is drawn from a uniform distribution on  $[1, 2]$ , the probability that one's opponent will quit by time  $t$ ,  $F(t)$ , is thus  $2 - c(t)$ . Algebra indicates that  $c(t) = 2/(2 - e^{-rt})$  and differentiation that the implied hazard rate for each state is

$$\frac{f(t)}{1 - F(t)} = \frac{-c'(t)}{c(t) - 1} = \frac{2r}{2 - e^{-rt}} \tag{3}$$

97. Hirshleifer and Riley 1992, chap. 10. For a more general analysis, see Hendricks, Weiss, and Wilson 1988.

A necessary condition for type  $c$  to wish to quit in equilibrium is that the marginal gain from holding out for another instant equals the marginal cost, or, for type  $c$ ,

$$\frac{f(t)}{1 - F(t)} \frac{1}{r} = c \quad (4)$$

In other words, the  $t$  that solves equation (4) is the best reply for type  $c$ , given  $F(t)$ . (Since the hazard rate given by equation (3) strictly decreases in  $t$ , the second-order condition for a maximum that corresponds to equation (4) is satisfied.) Substituting equation (3) into equation (4) yields

$$\frac{2r}{2 - e^{-rt}} \frac{1}{r} = c,$$

or

$$\frac{2}{2 - e^{-rt}} = c.$$

But this is just the expression for  $c(t)$  derived from the proposed equilibrium strategy  $t(c)$  given in the text. Thus if each player expects the opponent to choose according to  $c(t)$ , then each player maximizes its expected utility by choosing according to  $t(c)$ , and we have a Bayesian Nash equilibrium for the bargaining phase of the game.<sup>98</sup>

The bargaining phase, however, is not the whole game, and we need to check whether there are profitable deviations for any type when both phases are considered together (and under the assumption that trigger strategies are employed in enforcement phase). In particular, we must consider the possibility that a state might wish to choose a delay time different from  $t(c)$ , and then defect in the enforcement phase. But it is immediately clear that if  $r$  is small enough, no such strategy could be sequentially rational for any type  $c$ : If this different delay time were reached, no type would have an incentive to defect in the enforcement phase since the payoff for complying ( $y/r = 0$ ) will surely be larger than the payoff for defecting,

$$\frac{1}{r} [a(1 - e^{-r\Delta}) - ce^{-r\Delta}]$$

for small enough  $r$ .

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98. As is typical in wars of attrition, the Bayesian Nash equilibrium strategies are also perfect, that is, they imply equilibrium behavior in all subgames. A demonstration is omitted, but see, for example, Fearon 1994a; and Fudenberg and Tirole 1991, 219n11.

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