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Reciprocity in International Studies

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Introduction

One of the fundamental processes we observe in international politics is the process of reciprocity. Reciprocity is both a concept representing behavior and a representation of norms in political interaction. At its core, the study of reciprocity in international politics is concerned with the extent to which nations return behavior in kind. While some focus on ethical considerations and the propagation of norms such as the Golden Rule, others focus on the empirical examination of patterns of reciprocity. This empirical research searches for answer to questions about the existence, predictability, and diffusion of reciprocity. Scholars have investigated the conditions that produce reciprocity versus the conditions that make it more difficult. In addition, scholars have examined the way states engage in reciprocity across policy dimensions, answering questions about when governments link economic, diplomatic, and even military arenas.

In this essay, we seek to present the key findings about reciprocity within the body of research that is representative of the *Scientific Study of International Processes*. The study of reciprocity has generally occurred within two veins: formal/experimental and empirical research. The two veins have intertwined productively over the last half-century, and a significant proportion of this research draws from both approaches. For the purposes of exposition our essay mirrors the specialization often found in this research. We begin, however, with a discussion of the concept of reciprocity as it has been applied to the field of international relations. We then continue by summarizing the key findings generated within the formal/experimental literature and then move to the findings generated by empirical research. Our understanding of reciprocity cannot be fully represented within either of these approaches, however, so the reader is cautioned to consider the interplay and complementation of the research discussed below.

Reciprocity as a Concept in International Relations

Reciprocity is a word that evokes a deceptively simple understanding. At its most basic, the term refers to the

character of the actions and reactions between two or more actors. Often, this character is one of responding *in kind* to the actions of another. As such, reciprocity represents one of the fundamental processes scholars observe in the study of international relations. Moreover, a host of formal and experimental works developed in the early conflict processes literature pointed to the common conclusion that reciprocity was an efficient and successful road to cooperation. Even this basic interaction pattern, however, has been called into question. Dina Zinnes (1980) argued that despite reciprocity's success in formal and experimental settings, the evidence for the actual use of reciprocal strategies by states is mixed. Whether states actually respond reciprocally to each other remains an empirical question, and, if they do not do so, why they do not if, as the evidence suggests, reciprocity is a best response in many settings.

The study of reciprocity can also occur within a multitude of substantive interests within international relations. Classically, reciprocity has been associated with the study of arms races and an escalation to conflict, as well as the formal study of cooperation emerging in strategic dynamics. Reciprocity as a concept has applications in the entire realm of international relations topics, from the basic ingredients of cooperation (Axelrod 1984), the escalation and return of conflict (Leng 1993; Diehl and Goertz 2000), and the adherence to international law (Morrow 2007). While this interaction is typically dyadic (focusing on just two states at a time), reciprocity beyond the dyad has also been studied in search of reciprocal patterns that expand beyond bilateral relationships (Schrodt and Mintz 1988; Goldstein and Freeman 1991; Lee et al. 1994; Crescenzi 2007).

Regardless of the substantive focus, reciprocity is about the process and characteristics of the interaction among states in the international system. Scholars seek to understand how reciprocity is shaped by the kinds of interactions among states (e.g., cooperation versus conflict), the structure of the international system and the structural environment that surrounds the interaction, and the history that conditions interstate relationships. Reciprocity can also be a causal factor in the analysis, with the focus on how reciprocity can either ease or exacerbate the probability of war or violence between nations. As with most of the fundamental elements of political interaction, reciprocity is well studied but incompletely grasped by scholars and policy makers. We turn now to some specific examples of how reciprocity has been studied using formal and experimental tools of inquiry. Our essay then turns its focus to empirical investigations of the existence and impact of reciprocity in international relations.

Formal and Experimental Works on Reciprocity

Richardson's arms race model (originally proposed in 1939, but not published in book form until 1960) provided the first formal support for the idea that states engaged in arms races play reciprocal strategies. His models focused on the basic dynamics of reacting to an opponent's change in arms levels. This action-reaction process was a major innovation in the way international interactions were being studied at the time, but the aim of the work was also to identify the conditions of reciprocity that were most likely to avoid escalation to war. In this model four factors influence the level of arms that a state is predicted to have at a given time: that state's level of arms in the previous time period, the level of arms another state had in the previous time period, internal dynamics that might lead the state to reduce arms (or fail to increase) arms levels, and how warlike the state is. The second factor suggests the reciprocal nature of arms races. His work suggests that, under certain conditions, the unilateral initiation of arms reduction by one side could lead to mutual de-escalation. As discussed in the empirical section of this essay, Richardson's arms race model and others that imply reciprocity in international relations do not enjoy great empirical support. More works needs to be done to determine whether states do behave reciprocally and, if they do not, why they do not.

Reciprocity is commonly associated with the notion of fairness (e.g., "an eye for an eye" or "do unto others as you would have them do unto you"). Given this linkage, it is unsurprising that reciprocity has interested scholars of conflict, game theory, and rational choice for some time, as they examine the tension between fairness (which can sustain cooperation) and self-interest (which can undermine cooperation). What is more surprising is the formal and experimental evidence that suggests reciprocity is an extremely effective strategy for managing certain types of strategic situations. Here, "strategic" refers to situations in which one's payoff depends both on one's own action and on the actions taken by others, in which the interests of the actors are not in harmony. Specifically, reciprocity can be useful in situations in which one actor has the potential to benefit from an action that will lower the other's payoff from the game, but when both players choose these self-interested actions, both players in turn receive lower payoffs than they would have if they had been able to coordinate on another action.

We pause briefly now to introduce the iterated Prisoner's Dilemma (PD) as a useful way of modeling interactions between states or between a state and a nonstate actor. The problem of finding strategies to achieve mutual cooperation in the PD will lead us to a discussion of early experimental findings and the work of Robert Axelrod

(1980a; 1980b; 1984), which demonstrate the robustness of the reciprocal strategy known as tit–for–tat (TFT).

The Prisoner's Dilemma

The PD represents a strategic interaction between two actors in which each actor has a choice between a cooperative action and a noncooperative action. The structure of the game is such that if both actors choose the noncooperative action, they will both receive lower payoffs than if they had both chosen the cooperative action, but each actor has an incentive to choose the noncooperative action because each prefers the outcome produced when she is noncooperative to that when she is cooperative, regardless of what her opponent does.

Within the realm of conflict processes, the PD and formal frameworks are frequently used to represent arms races and similar security concerns. With only minor alterations to its structure the PD can represent many more strategic situations. Iteration is a common alteration of the basic PD, largely because of the belief that the iterated PD more closely reflects the reality of many situations in international relations. If state failure is an extremely rare event, then it follows that an interaction between neighboring states is unlikely to occur in isolation from other interactions with the same states (or even other states if reputation matters). Given that any interaction between neighboring states will be part of a series of interactions, researchers can more accurately model the interaction as an iterated rather than a single shot game. This switch to the iterated game has important implications for the results models produce. In the iterated PD it is possible, under certain circumstances, to achieve a cooperative Nash Equilibrium. This is because if the players do not know when the interaction will end and care sufficiently about future gains and losses that they will not be tempted away from higher long–term gains by lower short–term gains from defection, the potential for punishment will make the gains from any unilateral defection lower than those of continued cooperation.

In addition to the requirements above, for mutual cooperation to be a sustainable equilibrium in the iterated PD, both players must use a strategy that punishes defection sufficiently to encourage cooperation. There are many strategies that make the move of a player contingent on the previous moves of the other player, thereby punishing defectors. The differences in these strategies produce different levels of cooperation from other players, and the levels of cooperative play produced by a player's strategy will also vary according to the strategy adopted by that player's opponent. This means that while certain strategies will do well against certain other strategies in terms of either cooperation produced or total payoff, they may do less well against others. The success of a strategy in a strategic game depends on the strategy of the other player.

Early Experimental Findings

There have been many experimental studies of reciprocity in the PD. In these studies, reciprocity is modeled using TFT and similar strategies. In its most basic form, TFT is a strategy that dictates that the player begin by cooperating on the first move and on every subsequent move play the same strategy that the other player played in the previous round. Many of these studies employ college students who are pitted against others (either individually or in teams) or simulated "others" to play the PD or variations of that game. Many of these experiments are designed to study the effectiveness of various strategies or the evolution of natural play (play by test subjects not assigned or instructed on particular strategy options).

The *Journal of Conflict Resolution* devoted much of its June 1971 issue to articles dealing with the problem of "eliciting cooperative or nonhostile responses from parties who have some instigation toward noncooperative or hostile behavior" (Fink 1971:131). Within this issue, Stuart Oskamp (1971) provides a review of relevant findings from previous experimental work. The vast majority of the findings that Oskamp summarizes here indicate that the reciprocity–based TFT strategy and similar reciprocal strategies are much more successful at eliciting cooperation from other players (and thereby improving the payoffs for the player using TFT) than other strategies that were studied. This result holds for both the PD and several other games in which the players do not have entirely conflictual (represented in formal theory with zero–sum games) or entirely harmonious interests.

Wilson's 1971 experiment reported in the *Journal of Conflict Resolution* pits two–player teams of male college students playing the PD against what the players believe to be other similar teams, but is in most cases actually a colleague of Wilson's, playing one of four predetermined strategies. These strategies were TFT and three other conditional strategies: retaliation (begin with a cooperative move and respond to any noncooperative move with two noncooperative moves before returning to cooperation), conciliation one (begin with a cooperative move and play TFT, with the exception that you do not play noncooperative moves for more than three consecutive periods), and conciliation two (begin with a cooperative move and play TFT, with the exception that you do not play noncooperative moves for more than two consecutive periods). Wilson chose to focus on contingent strategies specifically due to previous results indicating that TFT performs no worse (and in several studies better) than certain other types of

strategies that are not contingent on the behavior of the other player.

The goal of the experiment was to determine if the slight variations on the strict reciprocity strategy TFT could produce more cooperation. Wilson cites Rapoport and Chammah's 1965 study of the evolution of cooperation over 300 rounds of play between 70 pairs of players as a motivation for his own work. Rapoport and Chammah found that iterated series of PD are about as likely as not to begin with a noncooperative move, and from this beginning, cooperation would become even less likely. From here, it seems likely that players who might adopt a TFT strategy would become caught in a series of noncooperation, however, what actually happened was that what the authors dubbed "recovery" would begin to set in after a number of rounds and the players would be able to achieve mutual cooperation (Rapoport and Chammah 1965). Wilson figured that for players to move from mutual defection to mutual cooperation would require at least some variation on TFT. Wilson suspected that for a contingent strategy to succeed it would need to be willing to occasionally forgo retaliation, hence the strategies conciliation one and two. Rather than the anticipated results, Wilson found that TFT evoked the greatest level of cooperation from the other player, and his retaliation strategy, although not as good as TFT, outperformed both conciliatory strategies.

A significant drawback to the experimental studies Oskamp reviews is that, as Oskamp notes, the procedures and results are sometimes inconsistent or incompletely reported making comparison between results of different tests more difficult. Both the experiments that Oskamp reviews and those of Wilson (1971), Rapoport and Chammah (1965), and Bixenstine and Gaebelein (1971) incorporate only a small number of strategies. As a result, while the findings of several of the studies indicate that TFT outperforms strategies such as always cooperate, always defect, randomize, or even a few variations on TFT, this in itself tells us little about how TFT, and by extension reciprocity, might perform relative to more complicated strategies which may or may not rely on contingency.

Axelrod's Tournaments

In 1980, the American political scientist Robert Axelrod invited game theorists from several fields to submit strategies for competition in a computer tournament that was to simulate an iterated PD. Each strategy would be pitted against each of the other strategies that had been entered, its twin, and a strategy, which chooses randomly between cooperation and defection. Axelrod reasoned that while experiments such as those conducted in the 1970s demonstrated the responses that many humans might make in everyday life without extensive strategic thought, the experiments tell us little about how best to play the PD precisely because the players' "appreciation of the strategic subtleties is bound to be limited" (1980a:29). Axelrod wondered how the results of an iterated PD might differ if the players had extensive knowledge of the game and strategic thought. Scholars from five fields: sociology, political science, psychology, economics, and mathematics submitted a total of 15 strategies. The simplest of these strategies, TFT, outperformed all others. TFT, submitted by Anatol Rapoport, stipulates only that players should cooperate on the first move with any given partner and on each subsequent move with that partner take whatever action that partner took in the previous round. TFT is a very basic form of reciprocity, which Axelrod defines as "a folkway which involves helping out a colleague and getting repaid in kind" (1984:5).

In his discussion of this initial 1980 tournament in *Evolution of Cooperation* (1984; see also Axelrod 1980a), Axelrod indicates his surprise at the success of TFT given its simplicity relative to the many strategies that attempted to improve upon it. Axelrod also notes that there were at least three strategies that would have outperformed TFT had they been submitted. These strategies included a variation on TFT in which a player would only defect after the other player had defected twice consecutively. That tit–for–two–tats could have won had it been submitted indicates that there might be benefits to being more forgiving rather than less forgiving. Tit–for–two–tats allows the other player to make mistakes occasionally or even to take advantage of its forgiveness. It would have performed particularly well against rules that begin with defection but are willing to reciprocate cooperation if it occurs. It would also have avoided locking into a conflict cycle with strategies that are mostly cooperative but try to sneak in an occasional defection. Axelrod also found that "nice" strategies – that is, those that do not defect first (or those that "will not be the first to defect before the last few moves, say before move 199" (Axelrod 1984:33)) – were substantially more successful than those that were not nice. The eight nice strategies in the tournament are also the eight most successful strategies. This suggests the somewhat counterintuitive notion that strategic actors might gain utility from behaving in a way that is both nice and forgiving.

Axelrod held a second tournament in 1980 to further investigate the findings of the first tournament. This second tournament was open to the public (and advertised in computer journals), and the 62 participants (resulting in a total of 63 strategies, including the strategy Random which randomly chose actions; for the full list and rankings of strategies, see Axelrod 1980b; 1984) were given the results from the first tournament. Entrants in the second round also received a report explaining some of the reasons (such as niceness and forgiveness) for TFT's success, which they

were able to use to design a strategy that might improve upon TFT and several rules that would have outperformed TFT in the first tournament had they been submitted (such as tit-for-two-tats). Despite each participant having the above information with which to design a more effective strategy, TFT again won in the second tournament.

The results of this second tournament confirmed that TFT performs very well against many other types of strategies and that, on average, strategies that are nice and forgiving (but still willing to punish) are more effective (as measured by the total score of the strategy for the tournament) than those that are not nice and forgiving (or do not punish at all). The second tournament also confirmed that the performance of a given strategy depends heavily upon the other strategies with which it is paired. This is most apparent in the performance of tit-for-two-tats, which would have won had it been submitted in the first tournament but ranked 24th in the second tournament (Axelrod 1980b), meaning that in one context tit-for-two-tats would have performed better than TFT, while in another it performed worse than TFT.

That TFT outperformed all of the other strategies (both more and less forgiving than itself) even in the much larger second tournament suggests that it is robust to many changes in the strategic environment, even those changes designed to challenge it. This finding underscores the significance of the puzzle that Zinnes poses for scholars of international conflict: If reciprocity (as characterized by TFT) appears to perform best against many other strategies, why do we not see more evidence of its use in international crises? A possible explanation for this is that while Axelrod's tournaments indicate that TFT performs best against a wide variety of other strategies, "the precise level of forgiveness that is optimal depends upon the environment" (Axelrod 1984:120). More forgiving strategies are easily exploited by strategies that are less cooperative, but strategies that are less forgiving can result in mutual conflict when paired with those that could be persuaded to cooperate by a slightly more forgiving strategy. For example, tit-for-two-tats forgives isolated defections without punishment. This allows strategies that defect from cooperation, but never do so more than once consecutively to achieve a higher payoff (measured against a baseline of mutual cooperation) while lowering the payoff to tit-for-two-tats. Likewise, a strategy that is less forgiving, such as TFT or grim trigger (a strategy that cooperates unless either player has ever defected in any previous round of play), may induce defections from cooperation when faced with strategies that begin with defection and revert to cooperation only if the other strategy responds with cooperation (as might be expected from a player who is interested in the gains of cooperation but wary of the opponent's preferences). The optimal level of forgiveness in foreign policy and international crises will be addressed below.

Formal Findings

Richardson's arms race model discussed above was, in 1939, one of the first to address the potential for reciprocity in conflict processes. Despite the somewhat limited empirical support, it has become common for formal modelers to assume that states condition their behavior on the previous actions of others. From this basic assumption, modelers attempt to study how states can condition present actions on the past actions of others to their greatest advantage and what effect external factors, such as noise, issue-linkage, or varying concerns about future gains relative to immediate gains, have on the performance of reciprocal strategies.

The term "noise" is used to refer to unintentional disturbances to the strategic relationship, such as misperception and mistakes which, in the context of TFT-style reciprocity, can cause players to become locked into a cycle of defection even when both players intended to cooperate. Axelrod and Keohane (1981) contend that the effectiveness of reciprocity depends on the ability of players to identify defectors, focus retaliation on those defectors, and have sufficient incentives to retaliate (235). They argue that these conditions are harder to meet in issues of security than in those of economics. In situations of covert operations that might be expected from nonstate organizations, as well as from states hoping to avoid retaliation, identifying the actual defector from among those who would defect if they expected to avoid punishment can be very difficult and there is room for misperceptions or mistakes. Focusing punishment on a violent nonstate actor can become particularly difficult if the retaliating state cannot distinguish between members of the nonstate actor and civilians, or if the state cannot be sure of the location of the nonstate actor at any given time. Bapat (2006) addresses some of the ways that states negotiating with violent nonstate actors might overcome these barriers to reciprocity by incorporating a third party (host state to the nonstate actor) into negotiations.

Axelrod and Keohane note that a danger of TFT as a reciprocal strategy in practice is that in some situations actors may disagree on what past outcomes have been. Such disagreements are another example of noise. Axelrod and Keohane write, "Soviet-American detente collapsed partly because each side concluded that the other was not practicing reciprocity, but was, on the contrary, taking unilateral advantage of its own restraint" (245). A single misperception can result in a cycle of conflictual outcomes if all actors are playing TFT, even when no one intends to

deviate from that strategy. This happens when at least one side perceives the other to have defected, leading that side to defect in retaliation. Since neither side believes itself to have unfairly defected (or deviated from TFT), the relationship reverts to mutual defection as each side punishes the other for what it believes to be repeated unwarranted defections. Axelrod and Keohane present several ways that relationships might be restructured to make mutual cooperation supported by reciprocity more feasible.

Downs et al. emphasize the importance of information in reaching cooperative outcomes in arms races. Bluffing may occur when information regarding the preferences or capabilities of states is incomplete. When a bluff is called, an unwanted conflict may result if the bluffing party wants to maintain credibility (Downs et al. 1985). They add that noise in the form of bad intelligence – that is, when one side wrongly believes the other has defected and acts according to this belief – can also lead to noncooperative outcomes. Huth (1988) writes with regard to security issues, "a tit-for-tat policy of military escalation is effective primarily in situations in which the security dilemma exists but not in cases in which there are psychological biases that lead a potential attacker to exaggerate and misperceive provocation" (50). While a commitment to TFT can be effective at deterring rapid escalation, since it signals that any escalation by one side will be mirrored by the other, there are risks if information problems exist.

Molander's (1985) model indicates that incorporating a cooperative bias into TFT is preferred to playing basic TFT in the presence of noise. He suggests that when there is noise, the strategy of playing TFT (that is, reciprocating) with some positive probability and playing unconditional cooperation with some positive probability at any given move (a strategy sometimes called TFT with forgiveness) has a higher utility than playing strict TFT. When it is possible that the other player's previous move may have been made in error (or wrongly observed), it can be better to be more forgiving than the strict TFT strategy suggests.

Wu and Axelrod (1995) evaluate the relative success of four potential methods of coping with noise: generous TFT (Molander 1985); contrite TFT (avoid reciprocation when the other is punishing legitimately according to TFT); Pavlov (if only one of the two players defected on the previous round both will defect in the present round; otherwise cooperate); and GPavlov (the same as Pavlov, but replace 10 percent of defections with cooperation). Wu and Axelrod use both the tournament approach and the ecological tournament approach (in which, over time, the proportion of a particular rule in a population adjusts to reflect the relative success of that rule) with 1 percent noise (that is, 1 percent of the time a player makes the opposite of the intended move) to find that Pavlov and GPavlov perform poorly in the iterated PD with noise, while both alterations of TFT perform well. Generous TFT performs best (of the four rules introduced here and the 63 rules included in Axelrod's (1980b) second tournament) in the tournament approach, but as noise increases above 1 percent contrite TFT's performance exceeds that of the generous version. In the ecological tournament with noise, generous TFT performs well initially, but as the population adjusts to reflect the performance of the various rules contrite TFT begins to perform better and eventually dominates the population. Wu and Axelrod's results indicate that at very low levels of noise a generous version of TFT may yield the best results, but as noise increases, or for games that continue for a long time, a contrite version of TFT that accepts punishment without locking into a conflictual cycle may perform best.

In the 1985 special issue of *World Politics*, devoted to the examination of the emergence of cooperation in anarchy and the strategies that states can adopt to change their circumstances and achieve cooperation, Axelrod and Keohane suggest that to reach a stable cooperative outcome in conflict scenarios may be more difficult than in other scenarios, and may require establishing institutions that allow for monitoring of all parties and making other issues contingent on the security issue at hand (thereby lengthening the time horizon and making punishment more feasible), a practice often referred to as issue-linkage. Making unrelated issues contingent on a conflict outcome may mean tying together the affairs of various states (for example, making a trade relationship between two states contingent on one of those state's adherence to a peace agreement with a third state). If, as a result of issue-linkage, a state believes that there may be consequences in a different issue area, this could lessen the temptation to strike preemptively even when the state believes it could annihilate its target.

In arms races in which the actors have deadlock preferences (mutual defection is preferred to mutual cooperation), cooperative outcomes are much harder to produce than in those with PD preferences. In the same special issue of *World Politics*, Downs et al. (1985) write that deadlock preferences in arms races may occur under a variety of circumstances, including those in which domestic pressure for greater military expenditures raise the payoffs to building arms. Repeated play does not improve the chances for cooperation in a game of deadlock, because there are no gains associated with a move from mutual defection to mutual cooperation. The authors find that reciprocal strategies are not effective in games characterized by deadlock-style preferences, but that negotiation using issue-linkage may be effective. Through issue-linkage, reciprocity again becomes effective, as the structure of the game is

transformed to one in which there are motives to cooperate in the short term to realize long-term gains.

Dixon (1986) compares the success of Pruitt's (1969) issue-linkage model of reciprocity, which posits that reciprocal responses may occur on the same or another dimension as the action being reciprocated, with that of Triska and Finley's (1965) multiple symmetry model, which suggests that reciprocity should occur within the same issue area as the action being reciprocated. Using Azar's (1980) Conflict and Peace Data Bank (COPDAB) and two-stage least squares, Dixon determines that whether issue-linkage in reciprocity occurs seems (at least within the period of the COPDAB data and US-Soviet relations) to depend on the issue area of the original action (in certain issue areas, responses were more likely to occur in the same area, whereas in other issue areas issue-linkage was more common).

Goldstein (1995) uses empirical findings regarding reciprocity between the United States and China to inform a formal model of reciprocity in interactions between great power states. Goldstein's empirical work supports the use of a two-player model of reciprocity rather than a multiplayer model and the use of a single conflict-cooperation continuum (as suggested by the issue-linkage model). Goldstein finds evidence of "weak reciprocal responses and strong inertia in foreign policy," which is to say that states return less than a tit for a tat (460).

Axelrod (1981) addresses the question of the emergence of cooperation through reciprocity in a world of unconditional defection and the circumstances that would make reciprocity (represented by TFT) collectively stable. In this article, Axelrod proves formally that for TFT to support cooperation in the long term, the players using the strategy must care sufficiently about the value of future gains relative to current gains. This makes intuitive sense; if a player would prefer the payoff of defection in the current round (and nothing in future rounds) to the benefits of cooperation over a long period, then there is no incentive to cooperate regardless of the other player's strategy.

Axelrod and Keohane (1985) examine the ways in which the four factors they identify as important in making "the shadow of the future [concern for future gains] an effective promoter of cooperation" (232) affect the military/security and economic arenas within international relations differently. They suggest that these four factors might explain why cooperation may be achieved more easily in the economic sphere than in the military sphere even when the underlying structure of the interaction is the same. That is, even when an economic interaction and a military interaction can both be represented by an iterated PD, it may be easier to arrive at cooperation in the economic setting than in the military setting if the economic setting is more favorable with regard to these four factors. Axelrod and Keohane contend that economic settings rather than military/security settings are likely to be more favorable to cooperation because of differences on these four dimensions: "1. long time horizons; 2. regularity of stakes; 3. reliability of information about others' actions; 4. and quick feedback about changes in the others' actions" (232).

Using a formal analysis, Goldstein (1995) finds that in most PD-type situations limited reciprocity is nearly as effective as full reciprocity (or, part of a tit for a tat is nearly as effective as a full tit for a tat). Goldstein attributes this result to the effect of the long shadow of the future in superpower relationships (because these states place great value on future gains as well as present gains, their behavior will be moderated by even partial reciprocity). These results imply that, all else equal, the less a state (or its leadership) cares about future gains, the stronger reciprocity must be in order to deter noncooperative behavior. States (or governments) that do not expect to last long should require a large fraction of a tit for a tat to be deterred from a noncooperative action, while more stable states (or governments) should require only a small fraction of a tit for a tat in order to be deterred, *ceteris paribus*.

Huth (1988) repeatedly stresses the ability of a reciprocal strategy to balance credibility and stability in a way that will provide maximum benefit to the actor using the strategy. Credibility in reciprocal strategies can be achieved when reciprocity does not require threats that would be so costly that the actor would not prefer to carry them out if called on to do so. This condition is more easily met in situations that are expected to be repeated multiple times, or in relationships that are expected to persist over time – that is, when the shadow of the future is long. Stability in reciprocal strategies results when reciprocation is limited in scale such that the defender does not raise the level of hostilities beyond that already reached by the aggressor.

Combining formal and empirical analysis, Huth uses a statistical analysis to provide support for his hypothesis that a conflict cycle based on one initial defection and retaliation could be prevented or ended by the use of what he calls "reciprocal accommodation." He submits that reciprocal accommodation as part of a strategy he calls "firm-but-flexible," in which "the defender adopts a mixed strategy of standing firm in response to the repeated demands of the potential attacker while offering compromise based on reciprocal accommodation" (1988:51-2) will be more successful at deterring potential attackers than will other strategies. Huth bases this claim on Schelling's (1966) logic that there are advantages to be gained from helping an adversary to save face while backing down from a threat.

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maximum benefit to the actor using the strategy. Credibility in reciprocal strategies can be achieved when reciprocity does not require threats that would be so costly that the actor would not prefer to carry them out if called on to do so. This condition is more easily met in situations that are expected to be repeated multiple times or in relationships that are expected to persist over time. Stability in reciprocal strategies results when reciprocation is limited in scale such that the defender does not raise the level of hostilities beyond that already reached by the aggressor.

Learning More about Models of Reciprocity

One weakness of computer simulations and formal models is their reliance on the particular assumptions made by the researcher. One effect of this weakness on the results achieved through these methods can be seen in the introduction of noise into the PD. In Axelrod's tournaments without noise (that is, players always make the move dictated by their strategy; there are no mistakes), TFT outperforms all other strategies. When noise is added (mistakes are possible), the performance of TFT declines. This indicates that when choosing a strategy it is critical to consider the strategic environment (what the other players' strategies are likely to be, how many other players are there, whether mistakes or misinterpretations are possible, etc.) and choose accordingly.

This has been a brief but representative history of some of the more significant and general works on reciprocity generally and reciprocity in conflict process specifically. For more information on the role of reciprocity in international settings represented by strategic games other than the iterated PD, readers should consult Snyder and Diesing's (1978) *Conflict among Nations: Bargaining, Decision Making, and System Structure in International Crises*. Those who are interested in reading more about Axelrod's tournaments and the challenges and responses to them are referred to Hoffman's 2000 article "Twenty Years On: *The Evolution of Cooperation* Revisited" for a more comprehensive review of that literature. Leng's 1993 volume *Interstate Crisis Behavior, 1816–1980: Realism Versus Reciprocity* may be of interest for those interested in particular aspects of reciprocity and their workings in actual interstate interactions.

Empirical Works on Reciprocity

In the previous section, we have seen that the game-theoretic and experimental literature on reciprocity focus on the specific conditions under which strategic interactions may lead to reciprocity and what this implies for the realization and maintenance of cooperation and conflict. Based on this framework, empirical studies using large-N quantitative methods have concentrated on determining whether or not reciprocity occurs among unitary state actors and what the specific patterns of reciprocity may be. Broadly speaking, scholars have worked toward producing a more nuanced specification of reciprocity either as a norm or specific response-in-kind to specific actions by looking at whether or not major powers reciprocate each other's actions and how they do so. Researchers have adopted different approaches such as considering varying the length of time frames (long versus short), varying the number of actors involved by extending the bilateral reciprocity framework to a triangular relationship, and further examining reciprocity among a whole range of potential interaction partners in the international state system (Goldstein and Freeman 1990; Rajmaira and Ward 1990; Goldstein 1991; Goldstein et al. 2001; Crescenzi 2007).

Due to the different ways in which reciprocity is conceptualized, there have been mixed empirical findings (see Table 1). Some have identified strong patterns of reciprocity between major powers, while others have only observed reciprocity under constrained conditions or irregularly, using different conceptual tools (see Table 2). Substantive disagreements have emerged in regards to the treatment of reciprocity as a norm versus specific responses-in-kind to specific actions, and whether or not conflict and cooperation should exist as the two extremes on a single continuum versus as distinct practices that occur on separate dimensions. Most works focus on major powers (especially superpower rivalries), while some have expanded their horizons to specific regions and the nexus between international and domestic politics (Moore 1995; Brandt et al. 2008). More recently, another group of scholars has used reciprocity to develop theories of dynamic learning readily applicable to a wider range of state and nonstate actors and diverse issue areas. In the remainder of this essay, we will examine some of the core issues in detail.

Table 1 Evidence and patterns of reciprocity (categorization of past empirical findings)

	Reciprocity as a general norm	Reciprocity among some states	No reciprocity
US–Soviet or	Ward (1982)	Freeman (1983)	Ostrom (1977)*

*Works cited by Zinnes (1980).
Source: Adopted from Table 1.2 of Goldstein and Freeman (1990)

	Reciprocity as a general norm	Reciprocity among some states	No reciprocity
US–Soviet–	Hopmann (1972)*	Ward (1984)	Hollist (1977)*
Chinese relations	Hopmann and King (1976)*	Dixon (1985; 1986)	Cusack and Ward (1981)
	Hopmann and Smith (1977)*	Hybel and Robertson (1978)	Majeski and Jones (1981)
Other venues	Ward (1982)	Moll (1974)*	Duncan and Siverson (1975)*
(i.e., nonmajor power or regional pairs of states)	Wilkenfeld et al. (1972)*	Rattinger (1976)*	Rattinger (1975)*
	Milstein (1972)*		
	Burrowes and Garriga–Pico (1974)*		
	McCormick (1975)*		

*Works cited by Zinnes (1980).
Source: Adopted from Table 1.2 of Goldstein and Freeman (1990)

Table 2 Reciprocity and strategic behavior: game–theoretic versus quantitative approaches

Definition of reciprocity based on strategic behavior	Game-theoretic approach (Rapoport, Axelrod)	Quantitative-empirical approach (Richardson, Ward)
Reciprocal responses	Reciprocity (TFT)	Defense (reactivity)
Cooperative initiatives (based on underlying images and expectations)	Friendly starting move (no defection on the first move) Meta–rationality	Creation of negative grievances Long–term memory
Inertia	All defection strategies	Negative fatigue; short–term memory
Triangular response	Coalition formation, division of payoffs	Three–nation response system

Source: Adopted from Table 1.3 of Goldstein and Freeman (1990).

What can be seen as the classic approach to reciprocity examines the patterns of action and reaction between the US and the Soviet Union during the Cold War. Early works were founded on the aforementioned Richardson's stimulus-response model (1960) and provided the basis for contextual studies on the period leading up to World War I (Holsti et al. 1964). The model was set up to test whether any stimulus by one state would bring about a proportionate response in kind from another, so that with some simplification, changes in state behavior were seen to be determined by three main factors which include one's own past behaviors, response to other countries, and other motives that are derived from beyond dyadic relations. That is, changes in state behavior depend on factors including defense, fatigue, and grievances. Negative grievances refer to cooperative initiatives, while hostile initiatives are associated with positive grievances. Two simple equations that represent state X's and Y's behavior changes capture the net amount of cooperation and hostility in the dyad or a pair or states. The main advantage of this model is that it can explain how conflicts may spiral, which is a main concern of superpower arms races studies.

Recognizing the need to consider both cooperative and conflictual aspects of foreign policy behavior and the possible causal linkage between conflict and cooperation in determining patterns of reciprocity, Ward (1982) examines whether or not reciprocity takes place along the lines of similar types of behavior. Namely, he looks at cooperation responding to cooperation or hostility responding to hostility, or whether states respond to a mixture of cooperation and conflict. The author finds support for the former approach, which suggests that long– and short–term institutional memory, as well as immediate reaction in kind to cooperation or hostility separately, leave a mark on how states interact with each other in subsequent periods. Moreover, conflictual actions and reactions are found to be more routine than cooperative actions and reactions, meaning that the influence of long–term memory for cooperation is weaker than that of conflict, and that the Soviet Union was more likely to send asymmetric responses against hostilities while the US was more forgiving. This confirms that there was a tendency to reciprocate cooperation as well as hostile actions during the Cold War period due to high levels of reactivity.

Shifting the focus to nonreciprocity, Hensel and Diehl (1994) investigate why some states reciprocate military threats while others do not. On one hand, they find that target states are less likely to respond militarily to threats when the stakes are low, when the threat does not involve actual use of force, and when they are significantly weaker than its opponent. On the other hand, the authors find that target states are more likely to respond to threat in kind when it shares a history of conflict with its opponent, regardless of the outcome of that previous confrontation, and is experiencing internal instability due to civil conflict.

Other scholars depart from the action-response mechanisms of reciprocity and focus on the impact of issue domains on reciprocal behavior. Pruitt (1969) and Dixon (1986) emphasize issue-linkage; that is, how stimulus in one issue area could be met with a response from another. Specifically, Dixon (1986) contrasts this "issue-linkage model" to the "multiple symmetry model." The main difference between the two models is that while the multiple symmetry model follows Triska and Finley's (1968) interpretation that "each dimension must be maintained symmetrically, and this demands response in kind, along the same dimension in which the challenge occurs," (300) the issue-linkage model imposes no such restrictions on behavioral exchanges. Instead, it allows for a more inclusive specification of reciprocity that incorporates the possibility of cross-sector matching. Ultimately, this distinction shows which issue dimensions are better insulated from external changes than others. Empirical results show that a mix of the two reciprocity processes underlies the US-Soviet Union rivalry and that there is variation in the level of issue insulation. Both the US and the Soviet Union show strong within-sector reciprocity tendencies in the political dimension, but for the US, issue-linkage has more explanatory power for interactions that occur along the military and cultural dimensions.

Departing from dyadic analyses of conflict and cooperation, Goldstein and Freeman (1990) embark on a new phase of reciprocity research by accounting for triangular responses. From game-theoretic, psychological, and quantitative approaches to cooperation, the authors draw out a common norm of reciprocity; namely, the strategy of "combining reciprocal responses to another country with cooperative initiatives toward that country" (3). Emphasizing the strategic role of China, which greatly influenced superpower rivalry, they set out to determine whether the reciprocal relationship between two states (the US and the Soviet Union) is contingent on how either of those states previously behaved toward a third state (China), namely triangular strategic behavior. Despite alternative ways to explain major power relations in terms of rational expectations, the authors claim that the behaviors of the US, the Soviet Union, and China can be substantially explained by reciprocity or response to the behaviors of other powers.

Several interesting patterns were revealed throughout this study. First, consistent with previous works (Ward 1982), Goldstein and Freeman found that cooperative gestures tend to meet cooperative responses, where actions lead to responses in kind. Interestingly, the authors identify stable periods of reciprocity, including the mid-1950s to the late 1960s, and the early 1970s to the early 1980s, where these breakpoints coincide with three major interventionary wars during the Cold War – namely the Korean War, the Vietnam War, and the war in Afghanistan – where hostility levels in the strategic triangle peak. These periods roughly overlap with important political shifts on the domestic level, including Soviet leadership change and partisan shifts in the US presidency.

Second, the authors find evidence of policy inertia and bilateral reciprocity in all three states where none of the three states adopt an inverse response strategy. This means that no state becomes more cooperative after receiving hostile messages.

Third, they find evidence of actual triangular reciprocity only in Soviet-Chinese relations. Specifically, interaction patterns show that as net cooperation increased between the US and the Soviet Union and also between the US and China, hostility levels between the Soviet Union and China also saw a significant increase. What we can infer from these patterns is that the US had relatively more weight in the strategic triangle than its counterparts, and that outside threats increased dyadic cohesion such that China and the Soviet Union would punish each other for cooperating with the US (Goldstein and Freeman 1991).

Fourth, while the US showed stronger tendencies to reciprocate actions than the Soviet Union, the levels of consistency changed over time. That is, over 40 years, the US reciprocated consistently at first and then more inconsistently, while the Soviet Union reciprocated inconsistently at first and more consistently later on (Goldstein 1991). In agreement with scholars who consider reciprocity to be the basis for the evolution of international cooperation (Axelrod 1984; Axelrod and Keohane 1985), the authors conclude that triangular strategic interactions evolved toward more cooperation in a "two steps forward, one step back" manner, by means of a reciprocity norm. With the establishment of a limited reciprocity regime, they argue that the brink of cooperation has been crossed, so that there will be no return to major hostility in the international state system.

Using the aforementioned triangular framework, Rajmaira and Ward (1990) make an assessment of the generally

accepted concept of reciprocity by comparing different time frameworks. They find it problematic that while much theory and empirical evidence of reciprocity depends on short-term reactivity (Goldstein 1991), scholars tend to make mixed claims about reciprocity being driven by norms with persistent effects as well as immediate responses to actions in kind. For instance, when considering the dramatic unraveling of the Cuban Missile Crisis, it seems appropriate to argue that weekly or monthly time frames are more appropriate than annual observations in measuring reciprocity (Azar and Sloan 1975; McClelland 1983). Substantively, however, not only does this contradict Axelrod's (1984) theory and experimental findings about the evolution of cooperation via reciprocity under TFT policies, but also the reality of foreign policy bureaucracies and their cumbersome decision-making processes (459). Moreover, the quality of the evidence found for short-term reactivity is surprisingly weak (Goldstein and Freeman 1990). Thus, Rajmaira and Ward (1990) explore the possibility that reciprocity, as a longer-term norm, sets the general confines for short-term policies rather than everyday policies relying on short-term reactivity.

Some of their findings contradicted those of previous studies. Most importantly, Rajmaira and Ward do not find evidence of short-term reciprocity implied by Richardson's model as well as Axelrod (1984), Dixon (1986), Ward (1982), and Goldstein and Freeman (1990). Instead, they find that the behaviors of the US, the Soviet Union, and China were more likely driven by their past levels of behavior toward their rival state or behavioral inertia than by current behavioral exchanges. Also, given that there were no such histories of conflict or cooperation, the Soviet Union tended to send higher levels of conflict to the US than the US sent to the Soviet Union. Second, they find an underlying equilibrium level in superpower interactions, which determines the general pattern of conflictual or cooperative relations. Deviations from the equilibrium or "normal" behavior occur with immediate reciprocity resulting from momentary crises or other random events, but these "errors" are corrected, the equilibrium pattern is sustained, and they "drift" along together as time passes. These results are confirmed with the findings that the effects of reactivity diminish as reciprocity is established as a norm over time. This reflects the natural weakening of superpower rivalries since the 1950s, as these major dyads became more integrated with other states in the international system.

Calling attention to the issue of time, Rajmaira and Ward's (1990) approach not only attempts to explain cooperation and conflict as distinct movements, but also adequately explains the changes in net cooperation and net conflict over time. Distinguishing between, and also making, some linkages between short-term and long-term reciprocity, the authors provide a more nuanced explanation of what the nature of reciprocity is – specifically, how such a norm may be established and may evolve. The broader implication of this work is that major powers base their foreign policies on prior interactions, from which they derive "rational expectations" of the opponent. What this seems to suggest is that policy decisions may in large part be habitual, so that learning and updating takes place over a long period of time. Perhaps this sheds some light on the various complaints among the foreign policy scholars that (rival) states simply do not seem to learn, or do so in limited fashion (Etheredge 1985; Khong 1992; May 1992), suggesting the existence of a steep learning curve. Amidst the discussion of patterns of superpower reciprocity, Lebovic (2003) explores the limits of reciprocity by asking to what extent states could absorb or accommodate conflict before they would stop cooperating and choose to respond in kind. Calculating the different threshold levels of accommodation that vary by actor, situation, and target, the author finds that both states accommodated low and high levels of conflict throughout the Cold War period, although these periods rarely coincided. They also find that the US accommodated more conflict than the Soviet Union, and that both states were more likely to accommodate conflict with prior cooperation than without it. This last finding, which supports Osgood's (1962) claim that patterns of reciprocity may lead to the reduction of hostility, underlines the significance of behavioral histories and its influence on future interactions that provides the basis for research on dynamic learning.

Leng (1983) investigates a crisis bargaining situation to find that experiential learning leads states to focus on the outcome of the preceding crisis rather than on the specific bargaining strategy *per se*. If a crisis situation takes place between states with similar military powers, successful outcomes encourage state leaders to repeat the strategy employed in the previous crisis, while failures lead to the adoption of more coercive bargaining strategies in the next crisis. Specifically, he finds that during the Cold War period, the Soviets were more likely to respond in kind to peaceful US actions than to threats. The implication is that reciprocity does not occur independently of *realpolitik* factors, since policy makers consider both situational as well as strategic factors when making policy choices. Leng (1993) further analyzes the effectiveness of reciprocating influence strategies in militarized interstate crises and finds that states have a tendency to respond in kind to influence attempts. Namely, coercive strategies tend to induce coercive responses and cooperative strategies draw out cooperative responses. However, reciprocation of coercive influence strategies is stronger than responding in kind to cooperative strategies. Some additional findings on what determines the success of reciprocating strategies include the need to combine firm and flexible responses (carrot-and-stick) and to overcome uncertainty through explicit communication of intentions.

Crescenzi et al. (2001; 2008) and Crescenzi (2007) extend this learning dynamic to overcome the temporal and spatial constraints in the classic approach to reciprocity. The authors develop a dynamic model of interstate interactions that incorporates all conflictual or cooperative interactions over time and also takes into account extra–dyadic relations, meaning all possible interactions that a state could have with another state within the international system rather than the selective dyadic or triangular response framework used in previous works. Although not issue specific, it is advantageous to use this model to evaluate reciprocity, since it is a continuous measure of interstate conflict and cooperation that reflects the growth and decay of interstate relations over time.

With the end of the Cold War and the evolution of conflict beyond the superpower rivalry, scholars began to apply their state–level reciprocity models to regions that witnessed protracted conflict between smaller rival states or experienced third–party interventions where the international community (the UN and NATO) played an active role. Rajmaira (1997) finds that reciprocity within the Indo–Pakistani rivalry follows a more diffuse and stable long–term pattern that subsumes short–term reciprocity occurrences. While the regional rivalry has been defined in terms of short–term TFT interactions between the two countries, the findings suggest that rather than short–term responses, long–term memories play a major role in shaping future expectations of one's opponent. The implications are twofold. First, historical and cultural contexts are important in the study of regional rivalries and, second, rather than trying to link cooperative initiatives with conflict reduction, it may be better for India and Pakistan to pursue cooperation in less consequential areas, which may have spillover effects to a broader range of issues.

Emphasizing the importance of understanding how regional actors respond to external intervention in confidence building and conflict resolution, Goldstein and Pevehouse (1997) examine the Bosnia conflict to see whether there is a strategic triangular as well as bilateral pattern of reciprocity among the Serb forces, the Bosnian government, and the international community. They find some support for bilateral reciprocity between the Serb forces and the international community, meaning that Serbian behavior toward the international community directly responds to the way in which the international community behaves toward the Serbian forces. Some support is also found for triangular reciprocity in the international community, in that Serbian attacks on Bosnia were followed by the international community acting in kind toward the Serbian forces. In addition, Goldstein et al. (2001) set out to examine whether the presence of reciprocity in the Middle East helped improve regional relations. They look at both bilateral reciprocity between regional powers and triangular reciprocity toward the US, the main intervening power in the region. Evidence for bilateral reciprocity between Israel–Palestine, Israel–Syria/Lebanon, and Iran–Iraq was found in the periods 1979–90 and 1991–5, and some triangular responses toward US actions were identified in Israeli behavior toward Palestine in 1979–90, Palestine toward Israel in 1991–5, and Iraq toward the GCC in 1991–5. The authors conclude that although bilateral reciprocity is quite widespread in protracted as well as less conflictual relationships, it is not sufficient to increase long–term cooperation in the Middle East. Triangular reciprocity is rare; however, it may serve as an alternative way to pursue cooperation when bilateral reciprocity is absent.

A comprehensive assessment of the empirical literature on reciprocity would not be complete without a discussion of its limitations. One major point is that the linkage between the theoretical arguments and quantitative analyses remains somewhat weak. Reciprocity arguments assume that states engage in repeated interactions over time, as shown in the iterated PD game and TFT strategies, which requires a dynamic framework. However, most of the quantitative analyses remain static, meaning that most models examine how conditions at time t affect outcomes at time t rather than $t + 1$ in sequential fashion, which happens to exclude reciprocity concerns altogether. This is partly due to the fact that most of the data in international relations are simply not suited for such dynamic analyses. For instance, the International Crisis Behavior (ICB) and Militarized Interstate Disputes (MIDs) data collections are aggregates of different interactions that range from high to low levels of hostility, which makes it extremely difficult to determine whether or not reciprocity is present or at least imperfect. Since the 1980s, the Conflict and Peace Data Bank (COPDAB) and World Events Interaction Survey (WEIS) events data have been widely used in reciprocity research. Amidst some controversy, various statistical methods were developed to convert these events data into aggregate events–based time series. COPDAB, which covers a period from 1948 to 1978, uses a set of weights to create a separate cooperation and conflict scale that can be used on a single dimension. The WEIS dataset covers a longer time period and is categorical, meaning that the raw event types are grouped into a number of verb categories instead of a scale, bringing about much discussion on weighting schemes to create a conflict–cooperation scale (Goldstein 1992). What would be ideal is a sequenced events dataset, which is constrained in time and scope at this time.

Conclusion

Together, these works represent an evolution of the study of reciprocity that began almost 80 years ago with the work

of Lewis Fry Richardson. While much is known in the abstract about the impact of reciprocity on strategic and dynamic interaction, our empirical knowledge is less certain. Scholars have found clear evidence that reciprocity exists, including TFT behavior and reciprocity beyond the dyadic level of analysis. One area that may be fruitful for future research concerns the relationship between the time horizon of interaction and the practice of reciprocity. Current scholarship presents us with a bit of a puzzle: the expectation of a long time horizon for interaction should stimulate the incentive to cooperate, but long time horizons may also be associated with long pasts. A history of conflictual interactions makes cooperation far more difficult. Getting states, and their populations, to forget a conflictual past and focus on the possibility of reciprocal cooperation in the future is a challenge, to say the least. Perhaps the answer to this puzzle lies in the incorporation of reciprocity into more general models of international interaction.

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Comment on this article

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