

Reciprocity, Triangularity, and Cooperation in the Middle East, 1979-97

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Does bilateral reciprocity or great-power influence (or both) promote the emergence of international cooperation in regional conflicts? Using machine-coded events data and vector autoregression, time-series analysis of 12 international dyads in the Middle East between 1979 and 1990 and 1991 and 1995 found bilateral reciprocity widespread in both time periods, characterizing nearly all dyads of sustained conflict and a majority of other dyads with various power and proximity characteristics. Significant triangular responses to U.S. actions occurred in only a few cases, although key ones—Iraq with its neighbors and Israel with Palestine. Neither bilateral reciprocity nor triangular response predicted changes in long-term conflict and cooperation. Rather, the presence of one or both of these response patterns appeared to be necessary, but not sufficient, conditions for regional states to increase long-term cooperation.

FROM CONFLICT TO COOPERATION

International conflicts in the Middle East in recent decades present scholars and policy makers alike with daunting complexity, making simple models and solutions problematical. We analyzed these complex dynamics to assess the relevance of the substantial literatures on international reciprocity as a means to achieving stable cooperation. These literatures treat international conflicts as mixed-interest games (such as

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prisoner's dilemma) and promote a combination of reciprocity and cooperative initiatives as a formula to overcome the dilemmas inherent in such games.¹ Other literatures argue against this formula, claiming that only outside power can induce cooperation in the region. Our study did not address the structure of Middle East "games" directly (by measuring participants' preferences). Rather, we analyzed regional interactions empirically in a large *n*, cross-case, time-series design to see if those interaction patterns supported or contradicted competing theoretical approaches to eliciting cooperation in regional conflicts. Our quasi-experimental study of about 50,000 Middle East events over two decades asked four questions:

Question 1: Is bilateral reciprocity² a well-developed norm among states in the region?

Question 2: Does cooperation increase in dyads where reciprocity has developed more often than in other dyads,³ as actors overcome psychological hurdles and learn from repeated interactions?

Question 3: Especially if regional actors cannot overcome the hurdles to the evolution of bilateral cooperation, do they instead respond triangularly to the actions of outside powers (the United States in the case of the Middle East)?

Question 4: Does cooperation increase in cases that respond in this way to U.S. actions more often than in other cases?

These questions do not address the complex issue of when states actually take the kinds of cooperative initiatives necessary for reciprocity to engender cooperation rather than arms races and crisis escalation. Nor does our study of response patterns attempt to fully explain overall levels of cooperation in Middle East relationships—a far more complex question that encompasses domestic politics, personality, power, alliances, and other factors. Rather, we sought to isolate and systematically analyze those aspects of reciprocity, triangularity, and cooperation that could be tested using quantitative, longitudinal data from recent decades.

WHEN DOES RECIPROCITY DEVELOP?

Our first question is how widely bilateral reciprocity is found in regional dyads. The practice of bilateral reciprocity by relevant actors is a precondition for such reciprocity to possibly elicit cooperation in protracted regional conflicts such as those in the Middle East.

Past studies have found reciprocity to be a widespread behavioral pattern in social relationships across such disciplines as evolutionary biology (Trivers 1971),

1. In mixed-interest games, parties share some common interests as well as conflicting interests. Zartman (1976, 9) argued that all negotiations have this characteristic. The idea of combining reciprocity with cooperative initiatives emerged in the 1960s in several disciplines (Osgood 1962, 87-103; Rapoport 1967; Rapoport and Chammah 1965, 72, 207; Richardson 1960, 16, 228-30) and gained broad attention through the work of Axelrod (1984; see also Axelrod and D'Ambrosio 1994).

2. We define reciprocity as a sequential (lagged) response in kind, whether cooperative or hostile, to actions received from another actor. This corresponds with Keohane's (1986, 5-6) "specific reciprocity" as opposed to more generalized notions of mutual or group support or simultaneous action.

3. A *dyad* refers to a pair of countries, each directing actions toward the other. We distinguish *regional* dyads within the Middle East from *U.S.-related* dyads connecting a regional actor with the United States.

primatology (de Waal 1996, 24-27, 148; Silk 1992, 324), and developmental psychology (Levitt et al. 1985; Bugental and Goodnow 1998, 401-2, 411; Maccoby and Martin 1983, 86, 12, 72). Furthermore, past statistical analyses of international relations have found reciprocity fairly widespread, although specific studies vary.⁴ Whether reciprocity operates in the Arab-Israeli conflict, however, remains an open question. Some scholars suggest that unilateral cooperative initiatives, such as Anwar Sadat's 1977 trip to Jerusalem, are rarely reciprocated (Fahmy 1983), whereas other scholars argue that both symbolic and substantive acts of cooperation generate responses in kind (Kelman 1985).

Beyond the proposition that reciprocity occurs widely, social psychologists and sociologists have generally found that reciprocity develops more readily in relationships of approximate power balance than in imbalanced ones (Blau 1964, 25-31; Rubin and Brown 1975, 199, 214). Scholars of international negotiations have also treated power balance as conducive to reciprocity (and hence to agreement). However, Zartman (1997) broke with this conventional wisdom, and international relations theory generally does not link reciprocity to power balance. Our analysis tested whether power asymmetry, which characterizes most conflict dyads within the Middle East and all the U.S.-related dyads, impeded the development of reciprocity.

To test for the presence of reciprocity in a dyad, we first aggregated countries' actions to each other as movements through time along a scale of net cooperation—the weighted sum of all cooperative and conflictual events taken by one actor toward another in a time period (Goldstein 1992). We defined bilateral reciprocity as a positive correlation between a country's level of net cooperation toward another and the level of net cooperation previously received from the other.⁵

EFFECTS OF RECIPROCITY ON COOPERATION

Scholars disagree about whether reciprocity in an international relationship should produce greater cooperation over time. Absent some cooperative initiatives—Richardson's (1960, 16) "negative grievances" or Axelrod's (1984) admonition to "be nice"—reciprocity may produce a downward spiral or arms race. Scholars have analyzed the empirical effects of reciprocity in such issue areas as U.S.-Soviet and U.S.-Soviet-Chinese relations during the cold war, arms races, disarmament, crises, trade conflicts, monetary coordination, and debt negotiations.⁶ Most of these works have argued that, because the anarchical interstate system lacks a central authority to enforce agreements, states rely on reciprocity to deter cheating and achieve mutual gains. Most focus on psychological, institutional, or rational-choice factors that promote or impede the success of reciprocity in eliciting cooperation in these contexts.

4. Ward (1981, 230) called it the "golden rule of international politics—do unto others what they have recently done unto you." See Goldstein and Freeman (1991); Goldstein and Pevehouse (1997).

5. If this correlation were negative, it would indicate an inverse bilateral response. However, theory gives this type of response no importance, previous studies seldom find it, and Achen (2000, 19) showed that such responses, when found, probably result from model misspecification.

6. See, respectively, George, Farley, and Dallin (1988); Goldstein and Freeman (1990); Downs, Roche, and Siverson (1985); Evangelista (1990); Leng (1993); Conybeare (1987); Oye (1985); Lipson (1985). See also Axelrod (1984, 4); Gowa (1986).

By one line of reasoning, reciprocity usually should be sufficient for cooperation to develop. Rational actors should learn that in the presence of reciprocity, cooperative initiatives work better than hostile ones. Some case studies appear to bear this out. Jervis (1982, 366-67), for example, argued that in the 19th-century Concert of Europe, "The norm of reciprocity . . . allowed states to cooperate. . . ." He saw reciprocity as central to "security regimes" generally. Similarly, Rothchild (1997, 19-20, 227, 229, 244) found that—where other factors and strategies are conducive—reciprocity helped reduce the intensity of conflicts between African states and ethnic groups in recent decades.

However, formal and simulation approaches have been distressingly vague about the time frame in which a norm of reciprocity should elicit cooperation. We defined an increase in long-term cooperation within a time period as a higher average net cooperation during the second half of the period than the first half (see definition of 4- to 11-year time periods below). This means that, whatever the fluctuations during the time period, relations overall improved.

The learning process that should translate norms of reciprocity into cooperation moves at an uncertain speed. Rapoport and Chammah's (1969, 172-73) classic experiments measured this learning process as students played prisoner's dilemma games over hundreds of iterations. Overall, the amount of cooperation declined for about the first 25 repetitions of the game (from nearly 50% to about 36% of moves) before slowly turning upwards. It took about 75 repetitions for cooperation to return to the initial level and more than 200 repetitions before cooperation peaked at nearly 70%. If states followed a similar learning curve, international cooperation would emerge only gradually.

Given this slow process, political psychologists suggest that reciprocity elicits cooperation most readily in dyads of sustained (i.e., long-standing, serious) conflict in which interactions are frequent and ongoing, and mutual noncooperation is costly. As Pruitt (1998, 474) put it, "for the shadow of the future to be meaningful, people must know something about the pitfalls inherent in the current dilemma. Hence, prior experience of mutual defection (the DD trap) should heighten cooperation." In regional conflicts, a "hurting stalemate" in which neither side can win often helps conflicting parties learn to cooperate (Zartman 1989). To engage these arguments, we tested whether reciprocity and cooperation worked differently in dyads of sustained conflict than in friendly or only mildly hostile dyads. We defined sustained conflict as substantially negative net cooperation, on average, over a period of years—a definition that included, in practice, Israel-Syria (including Lebanon) and Israel-Palestine in both decades, Iraq-Iran in the 1980s, and Iraq-United States in the 1990s.

Other scholars argue more fundamentally that, even under widespread reciprocity, international cooperation does not naturally evolve. Political psychologists (e.g., Larson 1988; Tetlock 1998, 892-94) demonstrated the difficulty of getting enemies to take cooperative initiatives. Stein (1996, 250, 259-65) argued that relations between paramount leaders of conflicting states resist improvement because enemy images—psychological beliefs about the negative quality of the other person or group—"are extraordinarily difficult to change" once in place. Although strategies of incremental

reciprocity can help routinize and contain conflicts, the actual resolution of conflicts requires more “fundamental learning” (changing images of the other) of a kind that the small reciprocal interactions of tit for tat cannot produce.⁷ Psychological obstacles to cooperation may be especially salient in regional and ethnic conflicts (Morgan 1996; Stein 1996). For example, Kolodziej and Zartman (1996) argued that the “shadow of the future” is often overwhelmed by memories of the past.

In addition to these psychological critiques, some international relations scholars argue that reciprocity may not elicit cooperation because “the true prisoner’s dilemma is probably not a common situation in international politics” (Russett 1983, 115). Wagner (1983) suggested that international conflict and cooperation more often reflect deadlock and harmony games, respectively, than mixed-interest games. Indeed, empirical studies that classify cases by game structure find prisoner’s dilemma to characterize a minority of cases of international crises (Snyder and Diesing 1977), trade wars (Conybeare 1987) and debt rescheduling (Aggarwal 1996). Snidal (1985) likewise found more international relations cases fitting a “coordination game” than a prisoner’s dilemma. Bueno de Mesquita and Lalman (1992: 95-144) argued that the evolution-of-cooperation approach works only under a specific form of prisoner’s dilemma game rarely found in international conflicts. Neoliberal international relations theorists have considered the evolution of cooperation as an outcome of the mutuality of interest, the shadow of the future, and the number of players, but find that the structure of international conflicts “can limit the effectiveness of reciprocity” in eliciting cooperation (Oye 1985, 15-16). Neoliberal theory emphasizes the role of institutions, rather than simple tit for tat, in helping parties in conflict to jointly achieve better outcomes (Axelrod and Keohane 1985, 227; Baldwin 1993; Keohane 1984; Oye 1986).

Thus, even well-established norms of reciprocity are not sufficient to guarantee that cooperation will evolve in international conflicts, even in dyads of sustained conflict. And where cooperation does evolve, it may do so slowly. We were interested to find out whether the presence of reciprocity in Middle East dyads did in fact correlate with improving relations.

OUTSIDE POWER AND TRIANGULAR RESPONSE

Given the obstacles to the use of bilateral reciprocity to elicit cooperation in regional conflicts, some scholars focus on alternative strategies. One such alternative is that regional actors cooperate with each other in response to actions by a strong outside actor. Such an outside power, by playing some of the roles of a central authority (enforcement, patronage, and norm setting), may help regional actors to overcome distrust, solve social dilemmas, and thus achieve Pareto-optimal “win-win” outcomes that might never have developed from a self-help system alone (Kolodziej and Zartman 1996, 13).⁸

7. Ross (1993, 30) further argued that Axelrod’s (1984) admonition, “don’t be envious,” depends on culturally specific institutions and practices that govern group identity and intergroup relations.

8. This argument parallels the idea in international political economy that a hegemonic state can facilitate an efficient, open global economy (Kindleberger 1973, 28). Webb and Krasner (1989) suggested that economic hegemony can maintain security stability as well. Similarly, having a dominant leader may stabilize an alliance by reducing uncertainty (Gilpin 1981, 89; Waltz 1979, 168).

The outside-power framework applies in the Middle East straightforwardly because one such power—the United States—has dominated for the past three decades. Currently, the United States has military forces and equipment in six Middle East states, including the wealthiest (Saudi Arabia) and the most populous (Egypt) and is the primary ally of the strongest regional military power (Israel). The United States is the main mediator of the Arab-Israeli conflict and the leader behind international sanctions on Iraq and Iran. Forty percent of all U.S. foreign aid goes to the region (mostly to Israel and Egypt). No other outside power comes close to these levels of regional involvement.⁹ The United States has used its position sometimes to try to elicit cooperation between regional actors (as between Israel and Arab states) and at other times to impede cooperation (as between Iraq and its neighbors in the 1990s).

Given these active expressions of U.S. power, we asked whether triangular responses to U.S. actions would occur in regional dyads. We measured such responses by the positive or negative correlation between a country's net cooperation toward a neighbor and the net cooperation it had received recently from the United States.¹⁰

Triangular responses can be either reciprocal or inverse. A reciprocal triangular response means that one regional actor increases cooperation toward another after receiving cooperation from the United States. Appropriate policies to foster regional cooperation, then, are "soft-line," using inducements and reassurances. U.S. policies toward Israel and Egypt in the 1980s and 1990s exemplify this strategy. By contrast, an actor responds inversely to actions received from the United States if it takes advantage of U.S. cooperation to ratchet up hostility toward its rivals but responds to U.S. hostility by treating rivals more cooperatively. Empirically, inverse triangular responses to U.S. actions have been reported for Sino-Soviet relations during the cold war and for Serb forces' actions in Bosnia in 1993 and 1994 (Goldstein and Freeman 1991; Goldstein and Pevehouse 1997).¹¹ Inverse triangular response underlies the concept of "aggressive" states such as (for some U.S. policy makers) Iran in the 1980s and both Iraq and Serbia in the 1990s. To keep such actors in line, appropriate policies are "hard-line," using hostile initiatives.¹²

Among Middle East policy analysts, conventional wisdom long has held that significant Arab-Israeli cooperation could take place only with strong American inducement (Quandt 1993). However, two major breakthroughs in Arab-Israeli relations took

9. We exclude both Russia and Western Europe in the analysis because, in the words of Anwar Sadat, the United States held "99 percent of the cards" after the 1970s (see Telhami 1999, 380-81).

10. The model also showed whether the behavior of one Gulf country toward another correlated with previous behaviors among Israel and its neighbors. Some scholars think the Palestinian issue influences Gulf countries' actions (see Council on Foreign Relations 1997; Crossette 1998; Schrodtt and Gerner 1994; Suddarth 1997; Telhami 1997). Others, however, find the two issues unconnected (Satloff 1997).

11. Proponents of harder line U.S. policies toward Serbia in 1998 argued, for example, that "when the U.S. lifted sanctions on Belgrade . . . the first Serbian atrocities immediately ensued; and . . . [later] the U.S.-led rollback of sanctions was answered by a massive escalation of attacks on civilians" (Balkan Action Council 1998). However, Pevehouse and Goldstein's (1999a) statistical analysis found Serbia unresponsive, rather than reciprocally or inversely responsive, to Western actions regarding Kosovo.

12. The hard-line versus soft-line distinction is from Snyder and Diesing (1977, 298-303) and Jervis (1988, 326); it parallels Jervis's (1976, 78-82) "deterrence" versus "spiral" models. The appropriateness of soft- and hard-line policies reverses if the outside power wishes to impede rather than facilitate cooperation in a regional dyad. For example, the United States might direct friendly behavior to Iraq in the 1980s to encourage Iraq to attack Iran. This is still an inverse triangular response by Iraq.

place without direct U.S. involvement: Anwar Sadat's visit to Jerusalem in 1977 and the Oslo Accords between the Palestinian Liberation Organization (PLO) and Israel in 1993.¹³ Thus, some have suggested recently that Arab-Israeli cooperation can occur without U.S. involvement, relying on regional initiatives that promote bilateral reciprocity (Kemp and Pressman 1997; Satloff 1998). We try to provide some empirical benchmarks relevant to these unresolved policy debates.

DOES TRIANGULAR RESPONSE FAVOR THE EVOLUTION OF COOPERATION?

Where either reciprocal or inverse triangular responses to U.S. actions occur, does an increase in long-term net cooperation follow? The outside-power approach suggests that it should in cases where the United States wants net cooperation to increase. If U.S. actions influence bullies to stop attacking neighbors, or rivals to work out their differences at the negotiating table, then relations in the regional dyad should improve. We were interested to see if this was true in any Middle East dyads.

DATA AND METHOD

To empirically test the record of reciprocity and outside influence in the Middle East across dyads and over decades, we began from tens of thousands of events reported on Reuters wire service, which we translated into events data (categories of action implying levels of hostility or cooperation). These data allowed measurement of daily movements up and down a conflict-cooperation continuum. In the resulting time series, we could identify statistically the patterns of reciprocity and triangular response, as well as changes in long-term net cooperation.¹⁴

ACTORS AND BEHAVIORS

To test patterns of response in the Middle East, we analyzed the behaviors of the most important regional actors toward each other and the United States. These actors took a variety of different kinds of actions toward each other, and we conceptualized these categories of action as falling along a conflict-cooperation continuum represented by Goldstein's (1992) scale of net cooperation.¹⁵

We aggregated actors at the country level, including behavior by and toward governments and nongovernmental groups in a country. For example, *Israel* included the

13. In longer term perspective, one could argue that Sadat's initiative followed the U.S.-brokered Sinai withdrawals and the stationing of U.S. troops there and that Oslo followed on the Gulf War and Madrid conference, which represented unprecedented levels of U.S. military and diplomatic presence in the region. Nonetheless, the immediate impetus for these breakthroughs was bilateral action within the region.

14. Like previous models of this kind, however, ours could not directly measure or explain cooperative initiatives (which by definition are not in response to anyone's previous actions).

15. The scale represents the sum of actions taken by an actor toward a target within a given time period. Each action is weighted by the magnitude of cooperation or hostility implicit in the act, and the weighted hostile actions are subtracted from the weighted cooperative ones.

actions of Jewish settlers as well as the Israeli government, and *Palestine* included Hamas as well as the PLO. Disaggregating these actors would have been difficult both conceptually and practically. Furthermore, enemies often lumped them together. For example, many Israelis thought the PLO could and should have controlled Hamas terrorism, and many Palestinians thought the Israeli government could and should have controlled settler groups.¹⁶ In two cases, we aggregated countries into actors. Syria and Lebanon—including all Lebanese factions except the Israeli-backed South Lebanon Army—were treated as a single actor,¹⁷ as were the six countries of the Gulf Cooperation Council (GCC): Saudi Arabia, Kuwait, Oman, Qatar, Bahrain, and the United Arab Emirates. We assigned each country a one-letter designation, so that a two-letter variable name indicated the actor and target for a stream of actions, for example, IP for Israeli behavior toward Palestine.

The following countries were included:

- A = America (United States)
- I = Israel
- P = Palestine
- S = Syria/Lebanon
- E = Egypt
- Q = Iraq
- N = Iran
- G = GCC

This is a minimal list of the most powerful actors in the Gulf and Arab-Israeli arenas: Iraq and Iran as the two most populous and militarily powerful states in the Gulf, the GCC states (collectively) as the most important economically, Israel as the region's foremost military power, Egypt as the most populous Arab state, and Syria (with Lebanon) as Israel's strongest military antagonist. The Palestinians, who were neither powerful nor had a state of their own, were included because of the centrality of the Palestinian-Israeli conflict for the region.¹⁸

The dyads included in our model were those connecting the United States with each of the seven regional countries, those connecting Israel with its three neighbors, and those connecting Iraq with its two neighbors—a total of 12 dyads, that is, 24 variables, in the model. These were the most important dyads in the region and received most news coverage in the 1980s and 1990s.¹⁹

16. As a robustness test, we recoded the daily time series for Palestinian behaviors toward Israel and toward the United States in the years between 1979 and 1990, including only official actions of the Palestinian Liberation Organization (PLO)/Palestinian Authority (PNA). These series are cross-correlated with the ones we used (including all Palestinian actors together) at about .85.

17. Again, Israelis typically think Syria can and should control groups in Lebanon.

18. The model we used was the most inclusive possible with available degrees of freedom. The addition of more actors to our already large statistical model would have quickly made it intractable. Both Russia and Europe were excluded because of their limited influence in the region in the 1980s and 1990s (see note 11). We excluded Jordan because of its relative weakness and the well-known inconsistency in its public and private actions toward Israel. Robustness tests showed that including Jordan did not add to the model's statistical power.

19. The dyads we omitted contained well under one event per week on average.

THE DATA

Our events data were generated using the Kansas Event Data System (KEDS).²⁰ First, raw stories from the Reuters newswire were downloaded from the Nexis/Lexis news service and filtered. Only the first line of the story—the lead—was coded; it usually contained the who, what, when, and where of the story. KEDS applies “sparse parsing” to extract the subject, verb, and object in a sentence (Schrodt, Davis, and Weddle 1994), using customized dictionaries for verbs and actors.²¹ Each verb phrase is associated with a World Event Interaction Survey (WEIS) code, which describes a type of cooperative or conflictual action. KEDS identifies a subject (source) and object (target) for the event (Gerner et al. 1994).²² Our coded data were aggregated—both weekly and daily for our study—into time series of net cooperation scores.²³ We used weekly aggregation for graphing and time stability tests (both being oriented to relatively long-term changes) and then analyzed response patterns (short-term) using daily aggregation.²⁴

Overall, our data contained roughly 54,000 events, of which about 48,000 occurred in the 12 dyads we included in our model (see Table 1). Our data combined two major KEDS data sets, each running from April 15, 1979, to June 10, 1997.²⁵ The first, coded by Schrodt and Gerner (1998), included actors in the Gulf region (Iran, the GCC states, and Yemen). The second was a modified version of Schrodt and Gerner’s (1997) Levant data.²⁶

To examine the face validity of the data as coded and scaled, we visually inspected graphs of the time series. Figure 1(a-c) displays the time series for six important variables. Each graph shows net cooperation from 1979 to 1997, with points above the zero line reflecting more cooperation than conflict and points below the line reflecting more conflict than cooperation (data aggregated weekly, vertical scales differ across figures).²⁷

20. The data set is archived as Pevehouse and Goldstein (1999b) and posted on the Kansas Event Data System (KEDS) Web site at <http://www.ukans.edu/~KEDS/data.html>.

21. For example, KEDS would find *attack* in a sentence, then look for several subpatterns of the verb. The phrase *called off attack* would receive a different match than only *attack* or *began attack*. KEDS can also code compound actors and multiple events in one lead. It de-references pronouns and can change passive voice to active voice constructs.

22. To customize dictionaries for a particular region, a human coder watches how the KEDS program codes leads and, when an event is coded incorrectly, modifies the actor or verb dictionaries appropriately.

23. There were no missing data because all Reuters leads and all weeks (or, for daily analyses, days) were included. A week (day) in which Reuters reported no codable events was treated as a true zero (net cooperation is zero). We missed small and routine day-to-day interactions that were not considered “news-worthy”; this may have biased net cooperation scores downwards if (as some scholars argue) cooperation is less newsworthy than conflict. However, this bias would be generally consistent through time and entails relatively small events, so we did not consider it a substantial problem for our analyses.

24. See Goldstein (1991) on aggregation periods (daily versus weekly, quarterly, and annually).

25. Reuters cut off all reports to Nexis/Lexis as of June 10, 1997.

26. We used the first data set for all dyads involving Iran or the Gulf Cooperation Council (GCC) and the second data set for all others. We changed a few coding rules, causing slight differences (overall correlation of .99 with the original data).

27. The figures show 5-week moving averages of weekly data for visual continuity, but analyses did not use moving averages. The basic validity of the data has been confirmed by Schrodt and Gerner (1994) for the Levant data and Schrodt and Gerner (1998) for the Gulf data.

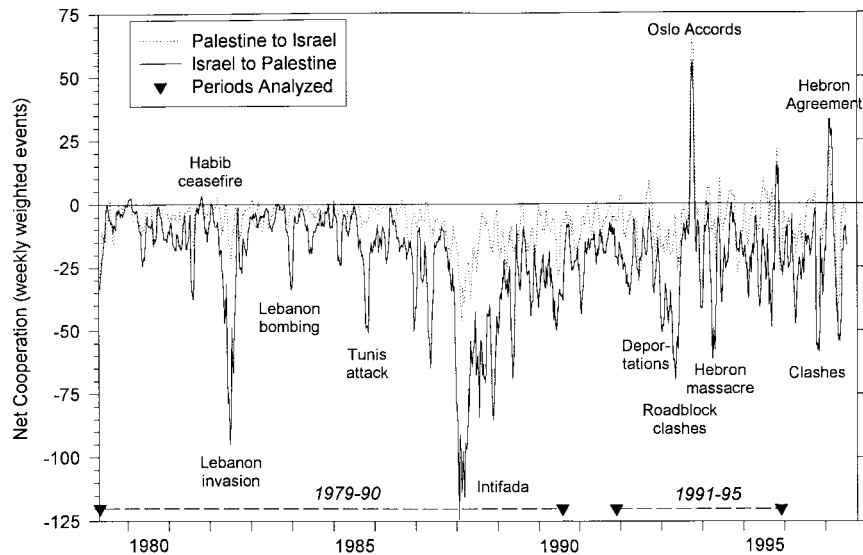


Figure 1a: Net Cooperation in Israel-Palestine Dyad

The trends and spikes in each graph correspond to major political developments in these dyads. In Figure 1a, the low points in Israeli-Palestinian net cooperation occurred around the Israeli invasion of Lebanon in 1982 and the early *intifada* (uprising) in 1988. High points included the 1993 Oslo Accords and the 1996 Hebron Accords.

Figure 1b shows the increase in net American cooperation to both Israel and the Palestinians after the Oslo Accords and shows that U.S. cooperation toward Israel before Oslo was consistently higher than U.S. cooperation toward Palestine. In Figure 1b, U.S. behavior toward Israel seems to covary with U.S. behavior toward Palestine. We confirmed this, finding a statistically significant ($p < .001$) positive cross-correlation of the weekly movements of the two variables (AI and AP). It suggests that the United States tended to reward or punish Israelis and Palestinians together rather than “tilt” back and forth by rewarding one while punishing the other. In part, this correlation of U.S. policies occurred because Israeli and Palestinian behaviors themselves tended to move together toward more or less cooperation, even if a catalyst for the movement came from one side (such as Palestinian suicide bombings or Israeli settlers’ killings of Palestinians). As we show later, this synchrony of movement in Israeli, Palestinian, and U.S. behaviors increased dramatically in the early 1990s.²⁸

Figure 1c highlights the shift in relations in the Iraq-Iran dyad from ongoing, intensely negative interaction during the Iran-Iraq war (1980-87) to sporadic, mild conflict since 1987. The most cooperative period was around the Gulf War, when Iraq sought Iranian support.

28. Although movements were synchronous, U.S. net cooperation to Israel was consistently higher than to Palestine.

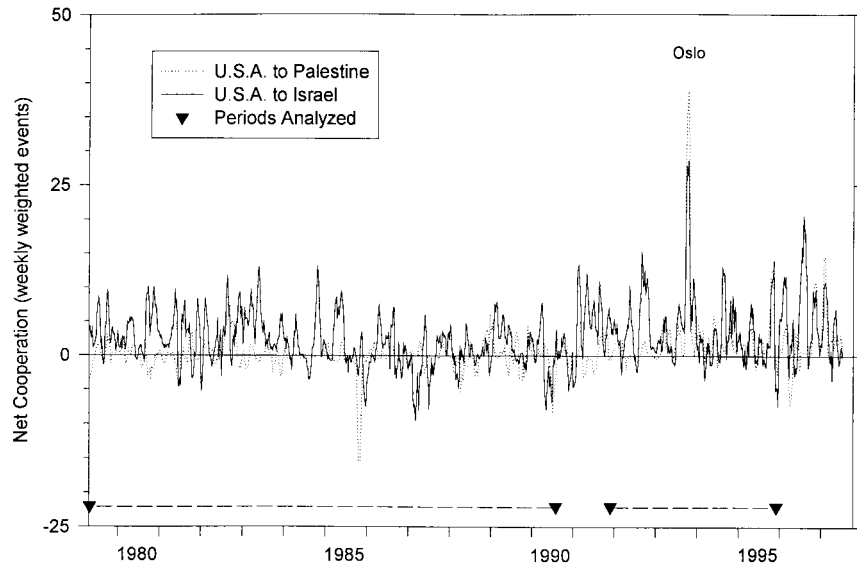


Figure 1b: American Net Cooperation to Israel and to Palestine

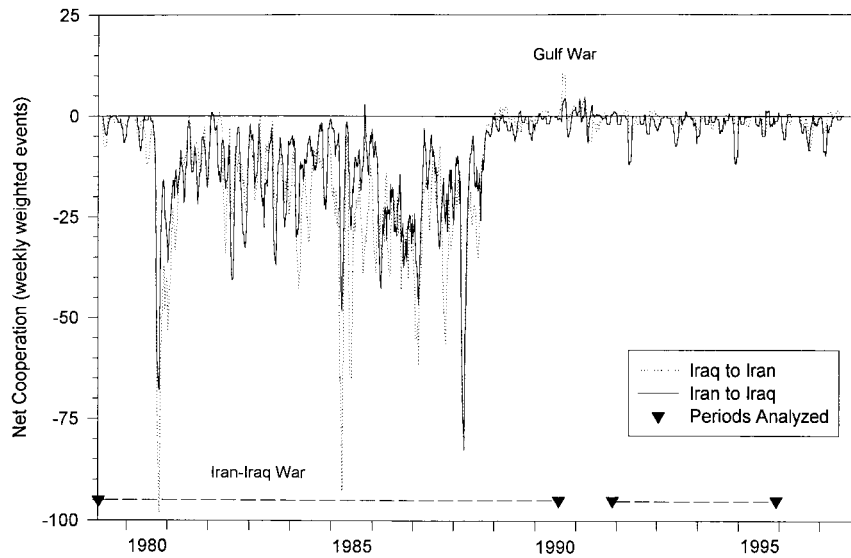


Figure 1c: Net Cooperation in Iraq-Iran Dyad

NOTE: Five-week moving averages depicted for visual coherence. Analysis does not use moving averages.

STATISTICAL METHODS

With some exceptions, statistical models that test for international reciprocity have been prone to several forms of omitted variable bias: omitted independent variables, lagged terms, and time-period corrections (see Goldstein and Freeman 1990, 26-28). Statistical solutions entail large models with many coefficients, requiring many observations to allow adequate degrees of freedom. KEDS allows the construction of long, detailed time series with adequate degrees of freedom to estimate models with many coefficients, helping to overcome these past problems.

To test for evidence of reciprocity and triangular response, we employed vector autoregression (VAR) (see Freeman, Williams, and Lin 1989; Sims 1980, 1987). A VAR model is a system of independent equations, with each equation having as the dependent variable one actor's behavior toward one other actor. Thus, our VAR model contained 24 equations. Each equation in a VAR system has the same right-hand-side independent variables, consisting of the recent past behavior of all variables in the system, including the dependent variable's own recent past, plus a constant and an error term. The "recent past" is represented by a certain number (which can be empirically inferred) of lagged terms for each dependent variable. A generalized form of the model is

$$X1_t = C_1 + \beta_{111}X1_{t-1} + \dots + \beta_{11k}X1_{t-k} + \beta_{121}X2_{t-1} + \dots + \beta_{1N1}XN_{t-1} + \dots + \beta_{1Nk}XN_{t-k} + e_1$$

$$X2_t = C_2 + \beta_{211}X1_{t-1} + \dots + \beta_{21k}X1_{t-k} + \beta_{221}X2_{t-1} + \dots + \beta_{2N1}XN_{t-1} + \dots + \beta_{2Nk}XN_{t-k} + e_2$$

.....

$$XN_t = C_N + \beta_{N11}X1_{t-1} + \dots + \beta_{N1k}X1_{t-k} + \beta_{N21}X2_{t-1} + \dots + \beta_{NN1}XN_{t-1} + \dots + \beta_{NNk}XN_{t-k} + e_N$$

where X s are variables (each measuring the behavior of one actor in a dyad to the other, N is the number of variables, k is the number of lagged terms, C s are constants, and e s are error terms.

After specifying the model in terms of included lags and temporal stability (as discussed shortly), we estimated a VAR model for each stable time period and evaluated it in two ways. First, block F tests assess the joint significance of one right-hand-side variable (including all its lags) on the dependent variable. The significance of individual coefficients (each particular lagged term) matters less than the combined significance of the lagged coefficients. Thus, each F test shows the significance of Granger-causality from one independent variable (lagged) to one dependent variable (unlagged). Second, we use "innovation accounting" (simulated shocks to the estimated model) to assess the nature of responses in the system (reciprocal, inverse, or ambiguous). As with most VAR analyses, we chart impulse response functions, or how the system—a simulation using the fitted coefficients from the earlier analysis—reacts when one variable is "shocked" by a one-standard-deviation increase in variance in one variable

(Cromwell et al. 1994, 60-61; Williams 1992).²⁹ We assess the direction of response by the sum of the point estimates of responses to this simulated shock over the same number of time periods as the lagged terms in the model. Where the sum is close to zero and includes both positive and negative terms, we characterize the response as ambiguous.

RESULTS

First, we will discuss the specification of the model in terms of coefficient stability through time and lagged terms. Then, we will answer the four questions posed earlier, based on the bilateral and triangular response patterns evident in the VAR models.³⁰

MODEL SPECIFICATION

We first tested the stability of the coefficients in the model through time. Stability here refers not to the time series themselves but the overall patterns of response as represented in the model coefficients. In an 18-year period, action and reaction patterns may shift over time. Incorrect assumptions about temporal stability can bias results and lead to faulty inferences. We tested this possibility and restricted our results to stable periods in which we could say empirically that the overall nature of responses in the model did not shift significantly (although particular dyads may have).³¹

In testing for stability, we began with a set of potential break points that scholars or policy makers treat as possibly marking changes in overall patterns of response among the actors (dates indicate the Sunday that begins a week's worth of data):

- April 15, 1979—beginning of data, right after Camp David and the expulsion of Egypt from the Arab League, around start of Iran-Iraq War.
- May 30, 1982—Israeli invasion of Lebanon, expulsion of PLO from Beirut.
- February 2, 1986—Iranian offensive on Faw Peninsula, perception that Iraq may lose Iran-Iraq War.
- December 6, 1987—Start of intifada (Palestinian uprising).
- July 1, 1990—Iraqi invasion of Kuwait, Gulf War follows in 6 months.
- October 30, 1991—Madrid peace conference, about 9 months after Gulf War.
- August 29, 1993—Oslo agreement (handshake on White House lawn).
- October 29, 1995—Israeli Prime Minister Rabin's assassination, followed by Hamas suicide bombings and the election of Israeli Prime Minister Netanyahu (June 1996).³²

29. This impulse analysis requires an assumption about the ordering of variables in the system. We order them from strongest actor to weakest, then repeat the analysis with the opposite ordering and disregard any results that are not robust against both orderings.

30. These analyses all used RATS386 (Regression Analysis of Time Series), especially the RATIO and vector autoregression (VAR) procedures, under Windows 95 on a Pentium computer.

31. The test for temporal instability amounted to using dummy variables to "blank out" one part of a time period (before or after a potential break point) and testing whether the model changed significantly overall. These analyses used Sims's (1980) ratio test.

32. Stability tests do not distinguish which of several proximal events caused a shift in response patterns.

We found significant changes in the model coefficients around the time of the Gulf War. Looking only at the period before the invasion of Kuwait, that is, from 1979 to 1990, we found no significant differences in the model overall across the 1982, 1986, or 1987 potential break points. Therefore, we treated the period from 1979 to 1990 (4,095 daily or 582 weekly observations) as a stable period in which we could meaningfully analyze patterns of response. In the post-1990 period, we found instability both before October 1991 (the invasion of Kuwait and the Gulf War) and after October 1995 (Rabin's assassination, the 1996 suicide bombings in Israel, and the election of Netanyahu). Therefore, we treated the period from the 1991 Madrid conference to the 1995 assassination as a second stable period (1,463 daily or 210 weekly observations).³³

Turning to daily time series, we specified the number of lagged terms in the model.³⁴ A series of tests comparing models with different numbers of lagged terms showed that 28 daily lags were needed for the 1979 to 1990 model and only 6 for the 1991 to 1995 model.³⁵ Therefore, our two models had 28 and 6 daily lags, respectively, for each independent variable (including for the lagged dependent variable as an independent variable).

Table 1 reports the mean net cooperation levels (weekly) of each variable over the stable time periods and the short periods between and after them. The average levels confirmed the basic validity of our data by reflecting the salient state of relations in key dyads in the various time periods. For example, the most consistently negative relations were in the Israel-Palestine dyad (with the Israel-Syria/Lebanon dyad also negative in all periods); the most intense hostility occurred in the Gulf War period between Iraq and the United States (and GCC); and the Iran-Iraq dyad was very negative in the 1980s during the Iran-Iraq war.³⁶

MODEL ESTIMATION—BILATERAL AND TRIANGULAR RESPONSES

We estimated VAR models for the periods from 1979 to 1990 and 1991 to 1995. Each variable regressed on its own past behavior and that of all other variables in the

33. Testing lags and time stability was iterative; we tried to test lags within a stable period and to test stability with the right number of included lags. Working initially with a 1979 to 1990 time frame (not presuming stability across the Gulf War) and with weekly data, we tested various numbers of lags (up to 52 weeks) and found 9 lags optimal. (There was a significant difference going from 1 to 3 lags, from 3 or 4 to 6, and from 6 to 8 or 9; but not going from 9 to 10 or 13, or from 13 to 26 or 52.) We then checked stability, using a 9-lag model, and found the period from 1979 to 1990, but not beyond, to be stable. In the 1990 to 1997 period we found instability across 1991. We then found for the 1991 to 1997 period that only 1 weekly lagged term sufficed; then we found (using a 1-lag model) that 1995 was unstable within 1991 to 1997, but 1991 to 1995 was stable across 1993.

34. Including too few lags can seriously bias VAR coefficients (Achen 2000, 23).

35. A model with the past 28 or 6 daily lags included (for the two time periods, respectively) gave significantly different results from a model with fewer past days included on the right-hand side but did not give significantly different results from a model with more past days, based on Sims's (1980) ratio test. Evidently the pace of interaction picked up in the 1990s. As a robustness check, we tested for needed lags in a model using weekly data aggregation and found one weekly lag sufficient.

36. Some biases may plausibly exist in the mean levels of variables, for example, if Reuters treats one country's actions as more newsworthy than another's. However, in analyzing short-term response patterns, these fairly consistent biases would not matter; they would affect only the constant in a fitted equation for one country's behavior toward another.

TABLE 1
Weekly Net Cooperation Levels by Time Period

Variable	<i>The 1980s:</i>	<i>Gulf War:</i>	<i>Early 1990s:</i>	<i>Post-Rabin:</i>
	<i>1979-90</i> (576 weeks) <i>Stable</i>	<i>1990-91</i> (69 weeks) <i>Transitional</i>	<i>1991-95</i> (209 weeks) <i>Stable</i>	<i>1995-97</i> (85 weeks) <i>Transitional</i>
Within-region dyads				
IP	-22.3	-19.0	-22.0	-20.6
PI	-7.3	-7.5	-5.6	-9.5
IS	-12.9	-5.1	-10.6	-15.5
SI	-4.2	-1.3	-3.5	-5.1
IE	1.5	0.1	0.7	1.2
EI	1.7	-0.6	0.9	-0.4
QN	-17.3	0.5	-0.7	-1.0
NQ	-13.2	-0.2	-1.8	-2.0
QG	0.1	-24.5	-1.2	-0.5
GQ	0.1	-10.4	-1.4	-0.3
U.S.-related dyads				
AI	1.9	3.3	3.9	4.1
IA	1.7	2.8	2.4	3.6
AP	-0.1	0.1	2.6	2.1
PA	-0.2	-0.9	1.1	0.5
AS	-1.0	2.1	1.2	1.3
SA	-0.4	1.4	1.1	1.2
AE	1.8	1.6	0.5	0.6
EA	1.3	0.9	0.3	0.5
AQ	-0.1	-38.5	-7.3	-6.6
QA	-0.1	-14.8	-3.7	-3.9
AN	-1.6	-0.2	-0.1	-0.3
NA	-2.1	-1.4	-1.3	-3.4
AG	0.7	-3.4 ^a	0.1	-3.4 ^a
GA	-0.0	0.6	0.3	-1.2 ^a

NOTE: A = America (United States), I = Israel, P = Palestine, S = Syria/Lebanon, E = Egypt, Q = Iraq, N = Iran, G = GCC (Gulf Cooperation Council). These averages demonstrated face validity and identified dyads of sustained conflict but were not used in the statistical model. They are mean weekly levels of net cooperation based on a sum of weighted actions, cooperative (positive numbers) and hostile (negative numbers), by the first country toward the second. "Stable" time periods (April 1979 to June 1990 and October 1991 to October 1995) were identified by specification tests discussed in the text. Transitional periods were too short to use in the analysis.

a. Negative levels in the AG dyad are caused by the inclusion of Iraqi-occupied Kuwait in the GCC and by the 1996 Dhahran truck bombing. We do not analyze either time period, however.

model (and a constant).³⁷ Past behavior was defined as 28 days of recent behavior for the 1979 to 1990 model and 6 days for the 1991 to 1995 model. These models allowed us to infer various patterns of response while taking into account all the various behaviors at once, minimizing omitted variable bias.³⁸

37. Tests on each series found no evidence of unit roots. These tests used augmented Dickey-Fuller, in Eviews3 (see Dickey and Fuller 1979).

38. We report all bilateral and selected (although a majority of) triangular responses. We do not discuss self-driven (autocorrelated) responses, which are significant at $p < .05$ in 22 of 24 variables in the 1979 to

TABLE 2
Patterns of Bilateral Response in 1979 to 1990 and 1991 to 1995

Dependent Variable (actions on one day)	Independent Variable (lagged)	1979 to 1990 ^a		1991 to 1995 ^b	
		p <		p <	
Regional actors' bilateral relations with each other					
Levant					
IP	PI	.004	+	.001	+
PI	IP	.001	+	.24	
IS	SI	.001	+	.09	
SI	IS	.001	+	.01	+
IE	EI	.38		.10	
EI	IE	.003	+	.07	
Gulf					
QN	NQ	.001	+	.001	+
NQ	QN	.001	+	.32	
QG	GQ	.06		.42	
GQ	QG	.87		.001	+
Regional actors' bilateral relations with the United States					
Levant					
AI	IA	.69		.03	+
IA	AI	.20		.03	+
AP	PA	.47		.001	+
PA	AP	.002	+	.001	+
AS	SA	.001	+	.03	+
SA	AS	.001	+	.001	+
AE	EA	.86		.83	
EA	AE	.004	+	.001	+
Gulf					
AQ	QA	.001	+	.001	+
QA	AQ	.001	+?	.001	+
AN	NA	.001	+	.57	
NA	AN	.001	+	.03	+/-?
AG	GA	.003	-	.13	
GA	AG	.001	+	.04	+

NOTE: A = America (United States), I = Israel, P = Palestine, S = Syria/Lebanon, E = Egypt, Q = Iraq, N = Iran, G = GCC (Gulf Cooperation Council). *p* levels show joint significance of lagged coefficients for independent variable in explaining unlagged dependent variable. Direction indicates reciprocal (+), inverse (-), or ambiguous (+? or +/-?) type of response.

a. May 13, 1979, to June 30, 1990: *N* = 4,067 days, 28 lagged terms in model, *df* = 3,394.

b. October 27, 1991, to October 22, 1995: *N* = 1,457 days, 6 lagged terms in model, *df* = 1,312.

Bilateral Responses

Table 2 reports the statistical significance and direction (reciprocal or inverse) of bilateral responses in the two stable periods. In the 1979 to 1990 period the three within-region dyads marked by sustained conflict—Israel-Palestine, Israel-Syria/

1990 period and 16 of 24 in the 1991 to 1995 period; these coefficients can be interpreted as policy inertia. We also omit discussion of some triangular response coefficients that are not relevant to our hypotheses.

Lebanon, and Iran-Iraq—all showed highly significant positive bilateral reciprocity in both directions. The two friendly dyads—Israel-Egypt and Iraq-GCC—had some reciprocity but less consistently. Among the U.S.-related dyads, the most significant two-way reciprocity was found in the U.S. relationships with Syria/Lebanon, Iraq, and Iran; whereas relationships with Israel, Palestine, and Egypt showed significant reciprocity less often. Of all the significant bilateral responses, only the U.S. response to the GCC states appeared to be inverse.

In the 1991 to 1995 period, the within-region dyads showed less two-way reciprocity overall compared with the 1979 to 1990 period. In three dyads—Israel-Palestine, Iraq-Iran, and GCC-Iraq—the first country reciprocated the actions of the second, but not vice versa. In the U.S.-related dyads in the 1991 to 1995 period, the significance of reciprocity was greater than in the 1979 to 1990 period for Israel and Palestine; about the same for Syria, Egypt, and Iraq; and lesser for Iran and the GCC. Only Iran's bilateral response to U.S. actions was ambiguous in direction in the 1991 to 1995 period, the others being reciprocal.

Thus, across both time periods, the overall pattern showed bilateral reciprocity to be common in both the regional dyads and the U.S.-related ones. The majority of variables—32 out of 48—showed significant bilateral response ($p < .05$), and, of these 32, all but 3 were unambiguously reciprocal (not inverse) in the direction of response. They included 11 of 20 within-region variables and 18 of 28 U.S.-related variables.³⁹

Putting together the data in Tables 1 and 2, we could assess the causes and effects of the presence of reciprocity in a dyad. Table 3 summarizes the relationship between reciprocity's presence in a dyad and the presence of sustained serious conflict (a possible cause of reciprocity) and an increase in long-term cooperation (a possible effect of reciprocity).

Of the 12 cases in which a country received sustained conflict from another during a stable time period, bilateral reciprocity toward that country was statistically significant in 10 (83%). In the 11th case, Israeli responses to Syria/Lebanon in the 1991 to 1995 period fell just short of significance—apparently just because they were too fast (actions and responses on the same day appear simultaneous, not lagged, in a daily time series; we discuss this issue below). The 12th case was Palestinian responses to Israel in the 1991 to 1995 period, which were not significant even though in the 1979 to 1990 period they had been.⁴⁰ Bilateral reciprocity was also strong, however, between actors that did not receive sustained conflict, 22 of 36 such cases being significant (61%).

Now consider the effect of reciprocity on changes in long-term cooperation during a stable time period. The four bottom cells in Table 3 show that (with the exception of the same case of PI in 1991 to 1995, with its U.S.-driven triangularity) bilateral reciprocity was a necessary but not sufficient condition for an increase in long-term cooperation during a time period. (All cases of increase in long-term cooperation were in variables receiving sustained conflict.) We measured this improvement by the “target” vari-

39. Clearly, reciprocity does not depend on power symmetry as speculated above.

40. The seeming unlearning of reciprocity coincided with a triangular response of Palestine-Israel (PI) in 1991 to 1995 (see below).

TABLE 3
Relationship of Bilateral Reciprocity with Sustained Conflict and with Increased Cooperation in 48 Actor-Target Pairs

	<i>Bilateral Reciprocity</i>	
	<i>Present</i>	<i>Absent</i>
Sustained conflict		
Present	10	2 ^{a,b}
Absent	22	14
Increased cooperation		
Present	5	1 ^a
Absent	27	15

NOTE: Each case is an actor-target pair (directed dyad) during one of the two stable time periods (i.e., 1979 to 1990, 1991 to 1995). There were no cases of increased long-term cooperation when sustained conflict was absent, so the lower "Present" line is a subset of the upper one. The two time periods are not independent tests, but the distribution across cells is similar across the two time periods (e.g., increased cooperation for first time period only: present 2,0; absent 15,7). Reciprocity is defined by the significance of the actor's bilateral response to the target ($p < .05$; see Table 2). Sustained conflict is defined by target's mean net cooperation less than -5 in the period (see Table 1). Increased long-term cooperation is defined by a difference, between the first and second halves of the period, of more than 1 scale point in the target's average net cooperation. The logic is that an actor that receives sustained conflict will develop reciprocity in its behavior toward the target and that an actor using reciprocity will elicit greater cooperation from the target.

a. Palestine toward Israel, 1991-95 (responds triangularly to U.S. actions toward Palestine).

b. Israel toward Syria/Lebanon, 1991-95 (reciprocity almost significant at $p < .10$).

able's change in weekly net cooperation from the first half of the time period to the second half.⁴¹ (The logic was that reciprocity elicits cooperation from the target.)⁴² What the table shows, however, is that an increase in long-term cooperation occurred for only 5 of 32 variables showing bilateral reciprocity (16%), and 1 of 16 cases without bilateral reciprocity (6%)—not a statistically significant difference ($p < .34$).

The critical cases were the 8 variables—4 dyads—in which both sides of a dyad received sustained conflict and responded with bilateral reciprocity. Of these, two dyads, Israel-Syria/Lebanon in 1979 to 1990 and United States-Iraq in 1991 to 1995, had an increase in long-term cooperation (i.e., less conflict). The other two, Israel-Palestine in 1979 to 1990 and Iran-Iraq in 1979 to 1990, had a decrease in long-term cooperation (more conflict). These results showed that bilateral reciprocity was not sufficient for cooperation to increase. However, they also cast doubt on whether reciprocity has any effect on cooperation at all. That question could not be answered using the cases of sustained conflict, because nearly all had reciprocity (leaving too little variation in the independent variable, reciprocity). Perhaps sustained conflict itself was the necessary condition for an increase in cooperation.

41. As a robustness test, we used an alternative measure of long-term increase in cooperation by measuring the change in the other side's average net cooperation from 1979 to 1990 to 1991 to 1995 (for the 1979 to 1990 variables) and from 1991 to 1995 to 1995 to 1997 (for the 1991 to 1995 variables). Results using this measure were qualitatively similar to those reported but with different outliers.

42. This is only one possible way to operationalize cooperation theory, but it is a reasonable first cut in our view.

By contrast, the remaining 36 variables (excluding both sides of the 6 sustained-conflict dyads) included variables with both significant (22) and insignificant (14) reciprocity. Although none showed an increase in long-term cooperation as defined earlier, 9 showed a decrease equivalently defined (i.e., as a decrease in net cooperation received, by more than 1 point on the scale from the first to the second half of the period).⁴³ This decrease occurred in 5 of the 22 cases with reciprocity (23%), compared to 4 of the 14 cases without reciprocity (29%), not a significant difference. Thus, reciprocity did not prevent a downturn in friendly or neutral dyads, any more than it ensured an upturn in conflictual dyads.

In sum, bilateral reciprocity characterized nearly all dyads of sustained conflict and also a majority of less conflictual dyads. However, reciprocity was a poor predictor of increased or decreased long-term cooperation.

Triangular Responses

Table 4 lists the statistically significant triangular responses to U.S. actions. The relevant type of response, in which a country changed its regional behavior following actions received from the United States, appears in boldface when found. Of 20 such responses possible, 3 were significant: Israeli behavior toward Palestine in 1979 to 1990, Palestine toward Israel in 1991 to 1995, and Iraq toward the GCC in 1991 to 1995. A 4th such response, that of Iraq toward Iran in 1979 to 1990, was almost significant ($p < .06$). Of these 4 responses, the Israeli and Palestinian ones were reciprocal, indicating that cooperation or conflict received from the United States was "passed along" in kind to the neighbor, whereas the Iraqi responses were inverse or ambiguous, indicating that Iraqi actions toward local enemies may have responded oppositely to U.S. actions toward Iraq. Thus, although triangular response was far rarer than bilateral reciprocity, the significant cases were plausible ones.⁴⁴ It is especially intriguing that Iraq showed a similar pattern (inverse triangular response) to Serbian forces in Bosnia (Goldstein and Pevehouse 1997), given the similarities of Iraq and Serbia as the main targets of U.S. military campaigns in the 1990s.

Although all 3 significant triangular responses of the relevant type occurred in dyads of sustained conflict, such responses were absent in 9 other cases of sustained conflict. In the 8 friendly or mildly negative regional dyads, no cases of such responses occurred.

Other, more complex responses to U.S. actions are also listed in Table 4; for example, Israeli actions toward Palestine in 1991 to 1995 appear to be affected by recent U.S. actions toward Palestine (top of right column). In the Iraq-GCC dyad in both time periods, both countries appear to adjust their behavior toward each other based on the same U.S. actions (toward Palestine in 1979 to 1990 and toward Iraq and Israel in 1991 to 1995). Overall, however, the triangular responses are relatively scarce. Each of the 10 dependent variables listed (within-region dyads) could potentially show response

43. Of the 9 cases of decreased long-term cooperation, 8 were in U.S.-related dyads, and 8 were in the 1979 to 1990 period.

44. These patterns were plausible, given that Iraq and Israel were the countries most salient for U.S. policy.

TABLE 4
Triangular Responses of Countries in Regional Dyads to U.S. Actions

Dependent Variable	Independent Variable (lagged) / Significance Level ($p <$) / Direction of Response	
	1979 to 1990 ^a	1991 to 1995 ^b
Levant		
IP	AI.02+	AP.03+
PI	(AP.14-) AN.03 +/-?	AP.01+ AI.03+ AQ.03+
IS	None	None
SI	(AS.12 -/+?)	AQ.001+ AN.03+
IE	None	None
EI	None	AN.01-
Gulf		
QN	(AQ.06-) AN.02- AG.03-	None
NQ	None	AI.01-
QG	AP.001- AS.001-	AQ.002+/-? AI.01-
GQ	AP.03-	AQ.001+ AI.03-

NOTE: A = America (United States), I = Israel, P = Palestine, S = Syria/Lebanon, E = Egypt, Q = Iraq, N = Iran, G = GCC (Gulf Cooperation Council). p levels show significance of lagged independent variable coefficients (F test) in explaining unlagged behavior of dependent variable. Local responses by an actor to recent U.S. actions toward that actor are set in boldface if $p < .05$ and listed in parentheses if $.05 < p < .15$. For other response types, only coefficients with $p < .05$ are listed. Direction indicates reciprocal (+), inverse (-), or ambiguous (+/-? or -/+?) type of response. The model includes the 10 variables listed and 14 other independent variables in U.S.-related dyads.

a. May 13, 1979, to June 30, 1990: $N = 4,067$ days, 28 lagged terms in model, $df = 3,394$.

b. October 27, 1991, to October 22, 1995: $N = 1,457$ days, 6 lagged terms in model, $df = 1,312$.

to U.S. actions toward any of the 7 regional actors in the model in either time period: 140 possible responses in all. Yet, only 19 of these (14%) are statistically significant at $p < .05$. Although this is more than twice the number of responses expected by random chance, it is not enough to warrant confidence in the particular significant cases or even in the overall tendency of variables to respond triangularly. What is clear is that triangular responses of any sort are far less common than is bilateral reciprocity.⁴⁵

ANALYZING RESIDUALS—RAPID RESPONSES AND SIMULTANEOUS ACTIONS

These day-to-day response patterns—bilateral and triangular—leave opaque the interactions that occur within a single day. In the Middle East, especially in the 1990s, when the pace of interaction quickened, these responses could matter—especially in Israeli responses to hostile actions from Palestine or Syria/Lebanon, which often occur

45. We rarely found triangular responses that connected the Gulf and Levant subregions. Of 48 such possible responses in the two time periods combined, only 3 were significant at $p < .05$ —hardly more than by chance. In addition, 11 responses from Table 4 connect the subregions indirectly through the United States. However, there are 136 such possible responses (each of 6 Levant variables and 4 Gulf variables on Table 4 with each of 6 U.S.-related Gulf variables and 8 U.S.-related Levant variables), so the 11 significant responses are again hardly more than by chance.

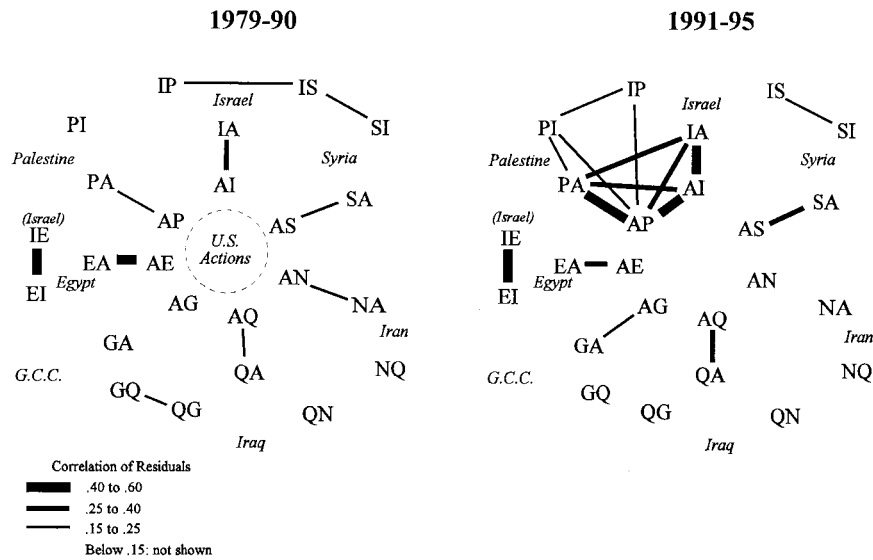


Figure 2: Contemporaneous Correlation of Residuals, 1979 to 1990 and 1991 to 1995
 NOTE: A = America (United States), I = Israel, P = Palestine, S = Syria/Lebanon, E = Egypt, Q = Iraq, N = Iran, G = GCC (Gulf Cooperation Council).

within hours. A daily time series cannot capture the sequence of such actions, but the cross-correlation of residuals in the model provides a partial view.

The residuals from the model are a time series for each variable representing that part of behavior not explained by recent prior behavior of any variables in the model (including the dependent variable's own recent behavior). When residuals from two variables are strongly cross-correlated with each other—something readily measured in the fitted model—it is likely that the two variables are moving somewhat in synchrony (cross-correlated) from day to day. In other words, those variables' within-day behaviors show a correlation beyond what can be explained by each of their responses to the past.

Unfortunately for purposes of interpretation, this could reflect any of several phenomena, only one of which is rapid reciprocity (which in turn might be either one-way or bidirectional). In particular, when countries take joint actions, for example, signing agreements, these actions are coded as two events, one in each direction in the dyad. This would create some cross-correlation of residuals for those two variables but would not reflect reciprocity as we define it (because it does not involve sequential actions).⁴⁶ Thus, finding correlation of residuals between two variables in the model may, but need not necessarily, suggest very rapid reciprocity occurring within a day.

Figure 2 illustrates the correlation of residuals in the model. These correlations pertain to two variables together, so they have strength but not direction. The strength of

46. Residual series may also cross-correlate if two variables respond similarly to a variable not in the model.

correlation is indicated by the thickness of lines connecting variables in the figure (all correlations larger than .15 are shown; no negative correlations above this strength are found). In the period from 1979 to 1990, 9 of the 10 pairs of variables that are correlated above .15 (all but IP-IS) represent bilateral dyadic behaviors, and most are probably explained by joint actions of the two countries.

In the 1991 to 1995 period, however, a tight cluster of residual cross-correlations appears in the America-Israel-Palestine triangle (right side of Figure 2). To some extent, all six variables in this triangle move together day by day in this period. The strongest residual correlations are in U.S. relations with both sides of the Israel-Palestine conflict, with weaker correlations on the Israel-Palestine axis itself. A metaphorical image that suggests itself is of America taking each side by the hand and thus inducing a certain synchrony of movements within the dyad. Most of these events are joint or simultaneous, so they do not qualify as reciprocity in our sense; yet, they provide a kind of indirect validation of the idea that U.S. actions in the region affect behavior within this dyad.

The case of IS in the 1991 to 1995 period (mentioned earlier) was one of various dyads in which the two bilateral behaviors showed some correlation of residuals (Figure 2), but it was the only such case in which the two sides were hostile and did not also show significant bilateral reciprocity. Because bilateral reciprocity was nearly significant ($p < .10$) and Israeli responses to attacks from Lebanon are famously swift, the case should probably be interpreted as bilateral reciprocity.

DISCUSSION

The analysis found a variety of bilateral and (more rarely) triangular responses by Middle East countries to each other's actions and U.S. ones. Furthermore, the significant responses in our model appeared through the fog of "noisy" events data; the real-world dynamics may be more complex. The results allow us to answer, partially, the questions posed at the outset.

Question 1. Bilateral reciprocity is quite widespread (Table 2). In nearly all dyads characterized by serious conflict, reciprocity was significant. Furthermore, most variables with positive or mildly negative net cooperation also showed significant reciprocity. Bilateral reciprocity occurred in both relatively power-balanced and power-imbalanced dyads and in both within-region and U.S.-related dyads.

Question 2. Bilateral reciprocity appears to be almost necessary, but not sufficient, for an increase in long-term cooperation (Table 3). Except for one case of reciprocity apparently too rapid to show significance, and one case of strong triangularity, every dyad that experienced an increase in long-term cooperation also showed significant bilateral reciprocity. However, although nearly all dyads of sustained conflict developed reciprocity, only half of those showed an increase in long-term cooperation. Indeed, the presence of reciprocity coincided with decreasing cooperation in some dyads of sustained conflict as well as some friendly or neutral dyads.

Question 3. Triangular response is far rarer (Table 4). The three significant (and one nearly significant) cases of triangular response of the relevant type all occurred in dyads of sustained conflict but were only one quarter of such dyads. In friendly and neutral dyads, no significant triangular responses occurred. Intriguingly, both cases of at least marginally significant inverse or ambiguous triangular response to U.S. actions occurred in Iraq's behavior to its enemies (i.e., the GCC in 1991 to 1995 and Iran in 1979 to 1990). Both cases of reciprocal triangular response were in the Israel-Palestine dyad (Table 4), a finding underscored by the positive correlation of residuals for the U.S.-Israel-Palestine triangle in 1991 to 1995.

Question 4. Triangular response to U.S. actions does not presage an increase in long-term cooperation (Table 4). Indeed, triangularity bore little relation to changes in long-term cooperation: both cases of possibly inverse triangular response (Iraq-Iran in 1979 to 1990 and Iraq-Gulf in 1991 to 1995) showed a modest decrease in long-term cooperation, and the two cases of reciprocal triangular response (Israel-Palestine in 1979 to 1990 and Palestine-Israel in 1991 to 1995) had opposite paths, less cooperative and more cooperative, respectively. Most dyads in which long-term cooperation increased did not show significant triangular responses.

Interestingly, the only "successful" outcome from triangular response, Palestine-Israel in 1991 to 1995, is the one outlier lacking bilateral reciprocity despite the presence of sustained conflict. This case could plausibly be interpreted as triangularity's superceding bilateral reciprocity, achieving bilateral cooperation by an alternate route. If so, both the outside-power and bilateral-reciprocity routes to cooperation may be feasible.

To summarize our results as succinctly as possible, bilateral reciprocity emerges in nearly all sustained conflicts and also in many less conflictual relationships. The existence of such reciprocity appears almost necessary but not sufficient to increase long-term cooperation. Both Iraq (inversely) and Israel or Palestine (reciprocally) appear to respond triangularly to U.S. actions in some periods and contexts. However, triangular responses to U.S. actions appear neither necessary nor sufficient for the emergence of long-term cooperation in a dyad. Nonetheless, strong triangularity characterizes the one case in which cooperation evolved despite an absence of bilateral reciprocity. The results, thus, generally support the idea that bilateral reciprocity supports the emergence of cooperation in the Middle East. However, they suggest that triangularity alone may work on occasion.

Future research can build on this experiment to expand both theoretically relevant and policy-relevant knowledge about the roles of reciprocity and triangularity in international conflict management. Methodological developments, both in events data and time-series statistics, allow for a new class of large-*n* studies that were previously impossible. Such studies provide sufficient degrees of freedom to correctly specify appropriate time-series models and are amenable to systematic replication attempts across dyads, regions, and time periods. Eventually, as data methods improve, we hope that empirical analysis can provide makers of foreign policy with reliable real-time information about the complex environments in which they must act.

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