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Cooperation and Game Theory in International Relations

Ae Jung KIM*

Abstract

Although a true prisoner's dilemma is probably not a common situation in international politics, many situations are in fact related or take the form of a prisoner's dilemma. Through theoretical assessment, the study demonstrates the importance of cooperation and explores the possibilities of game-theoretic approaches, mainly Axelrod's evolutionary approach to cooperation. The robustness of reciprocity is then explored through illustrating the different strategies of reciprocity and how such strategies are used.

Keywords : Cooperation, Neoliberalism, Game Theory, Strategy, Prisoner's Dilemma, Reciprocity

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Introduction

Achieving cooperation in world politics is generally viewed to be difficult. This is because of the structural and circumstantial dispositions of the actors in international relations. And yet, cooperation is at times attained. Theories of international relations offer various inductive and deductive methods of analysis in examining cooperation. Although this research is not designed to portray all of such approaches, this paper is designed to explore this subject in the following manner. First, the definition of cooperation will be briefly addressed, because as a term, cooperation is both ambiguous and aloof - there is the necessity to designate what this study will define cooperation as. Second, the paper will provide a descriptive analysis of how cooperation as a theme is dealt with in the theories of international relations. This will be done by assessing how cooperation is portrayed by different theories of thought in international relations. In doing this, the study hopes to examine how the attainability of cooperation is inscribed by different theoretical genres. Third, game theory will be assimilated as the fundamental guideline of this research. In this assimilation, this examination will designate the effectiveness of strategies of reciprocity and how it can be used in the dilemma this research is attempting to resolve.

1. Cooperation and Game Theory in International Relations

In order to study about cooperation in international relations, the matter of foremost importance is designating what cooperation means. Although conflict is commonly viewed as the antithesis of cooperation, unfortunately, this does not provide much in the way of understanding. Commonly, cooperation can only take place in situations that contain a mixture of both conflicting and complementary interest.¹⁾ Furthermore, cooperation can be realized through several different means in international politics.²⁾ Generally, we can categorize the types into: tacit, explicit, and imposed cooperation. Explicit cooperation indicates cooperation entailing a bargaining or negotiating process, examples being the negotiation of treaties and bargaining disarmament. According to Milner, this is the most

1) Harmony simply entails the absence of gains from defection. Generally, the question of cooperation can be referred to only when situations contain a mixture of both conflicting and complementary interests. See Kenneth A. Oye, "Explaining Cooperation Under Anarchy: Hypothesis and Strategies," in Kenneth A. Oye ed., *Cooperation Under Anarchy* (New Jersey: Princeton University Press, 1986), pp. 1-24.

2) According to Milner, cooperation can also be imposed by the stronger actor in a relationship that forces the weaker actor to compromise its policies. See Helen Milner, "International Theories of Cooperation Among Nations: Strength and Weaknesses," *World Politics*, Vol. 44, No. 3 (April, 1992), pp. 466-496.

common form of cooperation in international relations.³⁾ On the other hand, in tacit cooperation, the involved parties' cooperative behavior occurs as a result of convergence of the actors' expectations. The most notable example can be the prisoner's dilemma, where policy coordination is a result of calculated benefit from the payoff matrix. In an imposed cooperation, one party forcefully alters the behavior of opposite party. Imposed cooperation is often a result of hegemonic leadership in international negotiations.

When we break down cooperation into these categories, this research is concerned primarily about tacit cooperation. Accordingly, the following definition of cooperation offered by Robert O. Keohane best grasps the relationship between the involved parties for the purposes of this research - cooperation occurs "when actors adjust their behavior to the actual or anticipated preferences of others, through a process of policy coordination."⁴⁾ From this definition, three inherent features of cooperation can be extracted; (1) that actors' adjustment is directed toward some goal; (2) that vested effort is embedded in the process; and (3) that some type of benefit is presupposed by the bestowed effort. By using this definition, this research recognizes that achieving cooperation and sustaining a stable cooperative relationship, is a painstaking process, involving sacrifice from all involved parties. A notable magnitude of work has already been done in international relations theory in order to conceive the manner of this "effort," and to understand the possibilities of attaining cooperation.⁵⁾

As with other issues of international politics, realism has dominated the study of cooperation since World War II.⁶⁾ For realists, international anarchy fosters competition and conflict among states, inhibiting their willingness to cooperate even when they share common

3) *Ibid.*, p. 469.

4) Robert O. Keohane, *After Hegemony: Cooperation and Discord in the World Political Economy* (New Jersey: Princeton University Press, 1984), p. 51.

5) Among them, the major challenge to realism was the more optimistic view presented by liberal institutionalism, mainly in the form of functionalist integration theory in the 1940s and the early 1950s, and the neo-functionalist in regional integration theory in the 1950s and the 1960s, and interdependence theory in the 1970s. For functional and neofunctionalist see, David Mitrany, *A Working Peace System* (Chicago: Quadrangle Books, 1966); David Mitrany, *The Functional Theory of Politics* (New York: St. Martin's Press, 1976); James Patrick Sewell, *Functionalism and World Politics: A Study on United Nations Programs Financing Economic Development* (New Jersey: Princeton University Press, 1966); and Ernst B. Haas, *Beyond Nation-State: Functionalism and International Organization* (Stanford: Stanford University Press, 1964).

6) For realist works, see, E. H. Carr, *The Twenty Years Crisis, 1919-1939: An Introduction to the Study of International Relations* (London and New York: Harper Torchbooks, 1964); Hans J. Morganthau, *Politics Among Nations: The Struggle for Power and Peace*, 5th ed. (New York: Knopf, 1973); Kenneth N. Waltz, *Man the State, and War: A Theoretical Analysis* (New York: Columbia University Press, 1959); John J. Mearsheimer, *The Tragedy of Great Power Politics* (New York and London: W. W. Norton & Company, 2001); James N. Rosenau, *Turbulence in World Politics: A theory of Change and Continuity* (New Jersey: Princeton University Press, 1990); Michael W. Doyle and G. John Ikenberry eds. *New Thinking in International Relations Theory* (Boulder: Westview Press, 1997); Robert O. Keohane ed. *Neorealism and Its Critics* (New York: Columbia University Press, 1986); and Scott Burchill, Richard Devetak, Andrew Linklater, Mathew Paterson, Christian Reus-Smit and Jacqui True, *Theories of International Relations*, 2nd ed. (New York: Palgrave, 1995).

interests.⁷⁾ Furthermore, even in the presence of international institutions, realists argue that inter-state cooperation is problematic. Realism is based on the presumption that states in anarchy strive for survival as independent actors and this survival implies that achievements of joint gains that serve as an advantage for one state in the present might produce a more dangerous potential foe in the future.⁸⁾ Thus realist interpretations on cooperation deal with the problem of absolute and relative gain. Such perception can be best illustrated through Rousseau's stag hunt. Men in a stag hunt can cooperate to trap the stag and all are able to eat well. However, unlike the men in stag hunt, nations in international politics are faced with various obstacles that inhibit cooperation, mainly stemming from the anarchic world order. Evidently, realism presents a very pessimistic view on the prospect of international cooperation.⁹⁾

In addition to this, states worry about a division of possible gains that may be more beneficial to others than to themselves. According to Kenneth N. Waltz, this "is the first way in which the structure of international politics limits the cooperation of states."¹⁰⁾ Furthermore, states also worry that they can become too dependent on others through cooperative endeavors, such as the exchanges of goods and services. This, according to Waltz, is the second way in which the structure of international politics limits the cooperation of states.¹¹⁾ The realists' understanding of cooperation among states is closely linked to their emphasis on the structure of international system. A certain structure encourages certain behavior, and an anarchic structure usually works against achieving cooperation.

Inherently, although not all scholars with realist leanings will concur, realism's view is constrained by its predispositions. These predispositions are mainly: 1) states are the major actors in world affairs; 2) the international environment severely penalizes states if they fail to protect their vital interests or if they pursue objectives beyond their means; 3)

7) Joseph M. Grieco, "Anarchy and the Limits of Cooperation: A Realist Critique of the Newest Liberal Institutionalism," *International Organization* Vol. 42, No.3 (Summer, 1988), p. 485.

8) The term anarchy is one of the most prominent key themes in international politics. However, there is no common definition all adhere to. Conventionally, the term indicates the lack of an international government in world politics, or simply, the lack of central authority. Robert Axelrod and Robert O. Keohane note that military-security issues display more of the characteristics associated with anarchy compared to political-economic issues. See Robert Axelrod and Robert O. Keohane, "Achieving Cooperation under Anarchy: Strategies and Institutions," in Kenneth Oye eds., *Cooperation Under Anarchy*, pp. 226-254.

9) For this view, see Robert G. Gilpin, "The Richness of the Tradition of Political Realism," in Robert Keohane, ed., *Neorealism and Its Critics*, p. 304 and Hans J. Morgenthau, *Scientific Man vs. Power Politics* (Chicago: University of Chicago Press, 1946), pp. 187-203.

10) Kenneth N. Waltz, "Anarchic Orders and Balances of Power," in Robert O. Keohane ed., *Neorealism and Its Critics*, pp. 102-103.

11) *Ibid.*

international anarchy is the principle force shaping the motives and actions of states; 4) states in anarchy are preoccupied with power and security and are predisposed toward conflict and competition, often failing to cooperate even in the face of common interests; and 5) international institutions affect the prospect for cooperation only marginally.

The major challenge to realists' views on cooperation was the emergence of liberalism and especially, liberal institutionalism.¹²⁾ First, they objected to realism's proposition on the centrality of states as dominant actors in international affairs. Functionalists suggested that the key new actors in world politics were specialized international agencies and their technical experts; for neofunctionalists, they were labor unions, political parties, trade associations, and supranational bureaucracies; and for the interdependence liberals, they were multinational corporations and transnationals.¹³⁾ Secondly, liberal institutionalists countered the realist view that states are unitary or rational agents. Functionalists argued that authority was becoming decentralized within modern states and that a similar process was underway internationally.¹⁴⁾ Third, liberals argued that states were becoming less concerned about power and security. Fourthly, they accordingly also rejected realism's fourth proposition that states are fundamentally unwilling to cooperate. Liberals also rejected realism's pessimism about international institutions.

This new wave of challenges started in the 1940s and the early 1950s with functionalist integration theory. To functionalists, the key new actors in world politics were to be specialized international agencies and their technical experts. This was explained due to the decentralization within modern states and the similar process that was taking place internationally. The neofunctionalists advanced the debate by allocating that these specialized agencies were labor unions, political parties, trade associations, and supranational bureaucracies. The contribution of interdependence theory was that international politics was increasingly characterized by "multiple channels of access", advanced by transnational and trans-governmental coalitions of multinational corporations.¹⁵⁾

The neoliberalist claims about cooperation are based on the belief that states are atomistic actors. Unlike realists, they posit that states seek to maximize their individual absolute gains and are indifferent to the relative gains achieved by others. Cheating is seen as the

12) Grieco argues that neoliberalism has wrongly interpreted the realist analysis of international anarchy and therefore it misunderstands the realist analysis of the impact of anarchy on the preferences and actions of states. See Grieco, "Anarchy and the Limits of Cooperation," p. 487.

13) See David Mitrany, *Working Peace System*, pp.7, 85-87, 133-134; Ernst Haas, *Beyond the Nation-State*, pp. 32-40; and Robert O. Keohane and Joseph Nye, eds., *Transnational Relations and World Politics* (Cambridge: Harvard University Press, 1972), pp. ix-xxix, 371-98.

14) *Ibid.*, pp. 54-55, 63, 69-73, 134-38.

15) Grieco, "Anarchy and the Limits of Cooperation," p. 487.

greatest hindrance to cooperation among egoistic states, but international institutions can help states overcome this obstacle. In contrast to such liberal understandings, realism asserts that states are positional in character, and therefore in addition to the apprehensions about cheating, states also worry about relative gains.¹⁶⁾ In this sense, for realism, international cooperation is difficult based on two fundamental barriers, the problem of cheating and concerns over relative gains.

Notable advances in neoliberal claims with regards to cooperation were made by Robert Axelrod. In essence, neoliberals do not deny the anarchic nature of the international system, but argue that there is a need to emphasize "the varieties of cooperative behavior within... a decentralized system."¹⁷⁾ Recognizing that "there is no common government to enforce rules, and by the standards of domestic society, international institutions are weak," Axelrod developed an approach to cooperation that could bypass the theoretical reluctance on the attainability of cooperation.¹⁸⁾ States in anarchy are often entangled in situations of mixed-interests - a condition often referred to as non-zero-sum, and can be described by the prisoner's dilemma.¹⁹⁾

Neoliberal thinkers often employ game theory to explain why states do or do not cooperate, and their approach tends to emphasize the possibility of mutual wins, where similar interests can be arranged and compromised for joint benefit. Although states may be liable to defect without a central authority monitoring the accommodations, Axelrod noted that countervailing forces often do exist - forces that cause states to keep their promises and thus to resolve the prisoner's dilemma. Lipson notes that Axelrod's ideas are important because they, "obviously bear on a central issue in international relations theory; the emergence and maintenance of cooperation among sovereign, self-interested states, operating without any centralized authority."²⁰⁾

Fundamentally, game theory is a mathematical method of studying decision-making in situations of conflict, where game theorists study the predicted and actual behavior of individuals in games, as well as optimal strategies. Game theory describes the concept of

16) For arguments on absolute and relative gains, see Joseph Grieco, Robert Powell and Duncan Snidal, "The Relative-Gains Problem for International Cooperation," *The American Political Science Review*, Vol. 87, No. 3 (September, 1993), pp. 729-743.

17) Graham Evan and Jeffery Newnham, *The Penguin Dictionary of International Relations*, (London: Penguin Books, 1998), p. 189.

18) Axelrod and Keohane, "Achieving Cooperation," p. 226.

19) In 1950, Merrill Flood and Melvin Dresher devised a baffling riddle, which Albert W. Tucker later dubbed as the prisoner's dilemma. According to William Poundstone, the prisoner's dilemma is a precise mathematical construct and also a real-life problem. See William Poundstone, *Prisoner's Dilemma* (New York: Random House, 1992).

20) Lipson, "International Cooperation," p. 6.

cooperation as a "game" between players and classifies them into categories that determine which particular method one can apply to solving them. A common classification divides these games into zero-sum and non-zero-sum games. In zero-sum games the total benefit to all players in the game, for every combination of strategies, always adds to zero - a player benefits only at the expense of others. The game of chess or poker game is often employed as metaphor implying that one wins exactly the amount of one's opponent losses.

By contrast, non-zero-sum games work under the assumption that pure conflict is dropped from the game and the players face outcomes where they can both lose or both win, where coordination and cooperation emerge as alternatives to pure conflict. In principal, most real world situations in both economic and political fields are of a non-zero-sum nature - technically a gain by one player does not necessarily correspond with a loss by another. Analyzing zero-sum games is always easier because one can transform any game into a zero-sum game by adding an additional "dummy" player whose losses compensate the player's net winnings. Recalling our working definition of cooperation, this study is concerned about cooperation in non-zero-sum games. Mainly, game theory provides a model for interpreting, deductively, the logic of choices made by players in relation to other players in a game. A variety of games have been analyzed for this purpose. Such games include: stag hunt, chicken, harmony, deadlock, pure coordination, and most prominently, the prisoner's dilemma.²¹⁾

Although game theory has often been employed as one of the theoretical tools for international relations, it has been criticized on the grounds that the theory generally demands more information than it provides answers.²²⁾ For example: Who are the relevant actors? What are the rules of the game? What are the payoff structures? Is the game a one-shot or a repeated game? Furthermore, although many questions are demanded in applying the theory, game theory cannot always incorporate all of the available information. These include: the historical framework of the game environment, and the actual dynamics of the foreign policy making process. Similarly, there have been numerous questions as to whether game theory can be relevantly applied to complex phenomena such as international relations without incorporating psychological and cognitive elements so neglected in the theory.²³⁾ As Deborah Larson points out, simple game models omit many of the processes that are, in fact, critical factors in international relations, such as the images held of the

21) For detailed descriptions of different games, refer to Oye, *Cooperation Under Anarchy*, pp. 7-9.

22) Snidal, "The Game Theory of International Relations," p. 26.

23) Robert Jervis, "Realism, Game Theory, and Cooperation," *World Politics* Vol.30, pp. 319-20.

opponent, double standards and the significance of attaining reciprocity.²⁴⁾

In addition, game theory is often criticized for assumptions made on the rationality of decision makers. According to Joshua Goldstein and John Freeman, "rationality implies some objective criterion of self-interest which guides actors' choices. But there may be no objective criterion that defines the interests of a nation, in which various sub-units pull and tug toward conflicting goals."²⁵⁾ Furthermore, some critics argue that many of the conflicts in international politics modeled after the prisoner's dilemma often fit a coordination game rather than a prisoner's dilemma, with significant repercussions for the possibility of enhancing cooperation on some key international issues.²⁶⁾ And therefore, a "true prisoner's dilemma is probably not a common situation in international politics."²⁷⁾

Unfortunately, as a *theory*, game theory indeed is hampered by shortcomings when applied to pragmatic cases in international relations. However, in general, game theory has been widely applied to international politics as metaphor, analogy, or model rather than as a theory. Among the different usages, "most applications of game theory to international politics have been in terms of metaphor and analogy."²⁸⁾ Game metaphors and analogies often employ major game-theoretic themes, such as the payoff structure, shadow of the future, and strategies to discuss the issues of international politics.²⁹⁾ In game-theoretic

24) Deborah W. Larson, "The Psychology of Reciprocity in International Relations," p. 281-301. Larson recognizes that Axelrod's approach involves a kind of "learning" but relies on assumptions about the learning process that are contradicted by her psychological research. Others also hold similar views to Larson, see Joanne Gowa, "Anarchy, Egoism and Third Images: The Evolution of Cooperation and International Relations," *International Organization* Vol. 40, pp. 167-86; and Robert Jervis, *Perception and Misperception in International Politics*.

25) Joshua S. Goldstein and John R. Freeman, *Three-Way Street: Strategic Reciprocity in World Politics*, (Chicago: University of Chicago Press), 1990, p. 12; See also T. Moe, "On the Scientific Status of Rational Choice Models," *American Journal of Political Science*, Vol. 23, pp. 215-43; and Christopher Achen and Duncan Snidal, "Rational Deterrence Theory and Comparative Case Studies," *World Politics*, Vol. 41, pp. 143-69.

26) According to Snidal, cooperation in the coordination game depends on the surrounding social-political contexts, such as "established traditions or shared principles that are likely to provide the basis for the emergence of norms or conventions which will guide individual national behavior in an issue area." See Snidal, "Coordination vs. Prisoner's Dilemma: Implications for International Cooperation and Regimes," *American Political Science Review*, Vol. 79, pp. 923-42, especially p. 937 for difference between a game of prisoner's dilemma and coordination game.

27) Bruce Russett, *The Prisoners of Insecurity: Nuclear Deterrence, the Arms Race, and Arms Control*, (San Francisco: W. H. Freeman), 1983, p. 115. Others argue that nations often prefer mutual defection over mutual cooperation, displaying the characteristics of a game of Deadlock rather than prisoner's dilemma, see Harrison R. Wagner, "The Theory of Games and the Problem of International Cooperation," *American Political Science Review*, Vol. 77, pp. 330-46; and W. Downs, David Rocke, and Randolph Siverson, "Arms Races and Cooperation," *World Politics*, Vol. 38, pp. 118-46, reprinted in Kenneth A. Oye, ed., *Cooperation Under Anarchy* (Princeton: Princeton University Press), 1986.

28) Snidal provides examples of metaphors such as "falling dominoes," and the "Cuban missile crisis as a game of Chicken," and notes that analogies and models are to some extent simply more controlled metaphors. See Snidal, "The Game Theory of International Politics," pp.29-36.

29) For authors such as Duncan Snidal, the concepts of strategy, strategic rationality, preferences, and payoffs are incorporated. See Axelrod and Keohane, "Cooperation Under Anarchy," p. 228; and Oye, "Cooperation Under Anarchy: Hypothesis and Strategies," pp. 5-20; and Snidal, "The Game Theory of International Politics," pp. 36-37.

approaches, game themes are then deployed to study security dilemmas, through comparison with the prisoner's dilemma. The prisoner's dilemma has been applied to issues of arms race and control, crisis management, military alliances, monetary cooperation, tax policy coordination, and trade liberalization.

2. Shadow of the Future

No matter what type of game the players are playing, in a single-play game, there is always the temptation to seek immediate gains from unilateral defection. However, in repeated games, the effect is different. Then how does continuing the game affect the likelihood of cooperation? Iteration is known to increase the likelihood of cooperation in prisoner's dilemma and stag hunt, but diminishes the prospect for cooperation in chicken. The shadow of the future is closely related to iteration, because simply, iteration implies a shadow of the future. The shadow of the future can only be lengthened when there is a strong prospect for continued interaction.

Generally, the future is less important than the present, in other words, the payoff of the next move always counts less than the payoff of the current move. This, according to Martin Shubik, is due to two primary reasons. First, players tend to value payoffs less as the time of their obtainment recedes into the future. Second, there is always some chance that the players will never meet again.³⁰⁾ When players value future payoffs relative to the present, the likelihood that they will defect today lessens. Due to this logic, there is the need to enlarge the shadow of the future in order to promote cooperation.

If the future is important relative to the present, there are two major merits for the stability of that cooperation. First of all, "the players can each use an implicit threat of retaliation against the other's defection - if the interaction will last long enough to make the threat effective."³¹⁾ This is because, first of all, the interaction may not continue in the future. Secondly, the future is typically less important compared to the present because players usually prefer to get a gain today, rather than wait. Strategies based on reciprocity can only be effective if the iteration will last long enough to make the threat effective, "with

30) Shubik, 1970, The *weight* of the next move relative to the current move will be called w , presenting the degree to which the payoff of each move is discounted relative to the previous move. This discounted payoff is called a discount parameter by Shubik and this terminology is often employed by economic theorists. For example, if each move is only half as important as the previous move, the discount parameter is presented as $w=1/2$. In the field of international relations, shadow of the future is the preferred terminology. See Martin Shubik, *Strategy and Market Structure*, (New York: Wiley, 1990) and Martin Shubik, "Game Theory, Behavior, and the Paradox of Prisoner's Dilemma: Three Solociona," *Journal of Conflict Resolution*, Vol. 13, pp. 181-94.

31) Axelrod, *The Evolution of Cooperation*, p. 126.

a large shadow cooperation based on reciprocity is stable."³²⁾ According to Axelrod, there are two ways to enlarge the shadow: by making the interactions more durable, and by making them more frequent.

For a pragmatic example, we can refer to the strategic setting of Europe prior to the World War I where the shadow of the future was shortened in two distinctive ways.³³⁾ First, there were many advocating the perception that a decisive war was inevitable, suggesting that the iteration will not continue for too long. This meant that incentives for European states to engage in long-term s with one another were significantly reduced. Second, due to the lack of transparency surrounding the decision-making processes, transactions between states were restricted to a few large ones. Iteration was lessened and "the shadow of the future by magnifying the importance of each transaction relative to the next."³⁴⁾ By making small moves rather than a few large moves and thereby increasing the shadow of the future can make reciprocity more effective. Strategies of reciprocity can only improve the contemplation of cooperation under the conditions of iteration.³⁵⁾

3. Payoff Structure

Game theory, taking rationality for granted, assumes that players (states) pursue certain goals. A game analogy begins by analyzing players' motivations and examining how their preferences map into the payoff structure. Robert Axelrod has already illustrated that the payoff structure affects the level of cooperation in a game and that the greater the conflict of interest between the players, the greater the likelihood that the players would choose to defect.³⁶⁾ Determining and understanding the payoff structure in a game is key, for it determines the latitude of cooperation in that game. In Oye's words, "when is cooperation, defined in terms of conscious policy coordination, necessary to the realization of mutual benefits?"³⁷⁾ Players in any game must prefer mutual cooperation (CC) to mutual defection (DD) for mutual benefit to exist. The need for coordination arises when players prefer unilateral defection (DC) to unrequited cooperation (CD) and this sequence is the same for the

32) *Ibid.*, p. 128.

33) Stephen Van Evera, "Why Cooperation Failed in 1914," in Kenneth A. Oye eds. *Cooperation Under Anarchy*.

34) *Ibid.*, p. 109.

35) Oye, *Cooperation Under Anarchy*, p. 12; and Axelrod, *The Evolution of Cooperation*, chap. 3 and 4.

36) See Robert Axelrod, "Conflict of Interests: An Axiomatic Approach," *Journal of Conflict Resolution*, Vol. 11 (March 1967), pp. 87-99.

37) Oye, *Cooperation Under Anarchy*, p. 6.

familiar games of prisoner's dilemma, stag hunt, and chicken.³⁸⁾

However, there are many international situations that do not fall within this class of games. First of all, there are cases in which cooperation is not necessary at all. In game-theoretic terms, when there is an existing realization of mutual interests, or if actors prefer unrequited cooperation (CD) to unilateral defection (DC) from the beginning, there exists no reason to cheat - a situation called harmony.³⁹⁾ Secondly, there are international situations where there are undeniable absences of mutual interests, often referred to as deadlock. If at least one actor prefers always defecting (DD) to always cooperating (CC), conflict is inevitable and discussion over cooperation becomes meaningless.

Altering the payoff structure changes the fundamental nature of the game, transforming the conflict into a new type of game. For example, in a prisoner's dilemma, the initial incentive is to defect regardless of what the other player does, and the dilemma is that if both defect, both will do worse than if both had cooperated. If the initial preferences of the players shift from mutual defection to mutual cooperation, the game begins to resemble the characteristics of a lesser conflicting game, such as a stag hunt.⁴⁰⁾ A different shift in preferences can also make the game more conflicting than a prisoner's dilemma.

Due to the fact that payoff structures are affected by forces beyond the players' control (such as changes in the surrounding environment) the easiest way to change the payoff structure is by unilaterally altering the nature of the game. Oye notes that "unilateral strategies can improve the prospects of cooperation by reducing the costs of being exploited (CD) and the gains from exploitation (DC)."⁴¹⁾ For example, according to Jervis, this can be achieved when a hegemonic power favors procurement of defensive over offensive weapons. By doing so, the hegemonic power can reduce its own costs from exploitation through surprise attack (DC) and reduce its adversary's fear of exploitation (CD). Multilateral strategies such as the formation of international regimes can also shift the preference sequences. International regimes can, for example, create new norms which can be circumscribed by states. New information resulting from certain regimes can also change

38) Other games and their preferences in international politics are: (1) stag hunt, CC>DC>DD>CD; (2) chicken, DC>CC>CD>DD; (3) deadlock, absence of mutual interest; and (4) harmony, the absence of gains from defection. *Ibid.*, pp. 7-9.

39) Such a situation, where there exists no incentive to cheat, is called harmony. For a detailed description of cooperation and harmony, see Keohane, *After Hegemony*, pp. 51-55.

40) Robert Jervis explains this shift in preference with a balance-of-power system and concert system. According to Jervis, after a war against a hegemonic power, the other great powers often perceive a mutual interest in continuing to work together to ensure that the defeated hegemony does not rise again, thereby displaying characteristics of a stag hunt.

41) Oye, *Cooperation Under Anarchy*, p. 10.

states' interests.⁴²⁾

Thomas Schelling points out that in real world cases, governments step in to change the effective payoffs. Simply stated, one who breaks the law will be caught and sentenced. What governments and laws do is to make defection less attractive a choice. In international relations, this advice implicates that there is an international regime, which is able to force its will on to nations. In addition, major changes in the payoff structure can transform the fundamental structure of the game, so that it is no long a prisoner's dilemma.

However, according to Axelrod, even a minor change in the payoff structure can make cooperation based on reciprocity stable.⁴³⁾ What is needed is for the long-term incentive for mutual cooperation to be greater than the short-term incentive for defection. According to Axelrod, "if the punishment for defection is so great that cooperation is the best choice in the short run, no matter what the other player does, then there is no longer a dilemma."⁴⁴⁾ Furthermore, even a slight alteration of the payoffs help make cooperation based on reciprocity more stable, even when the game is still a prisoner's dilemma. Basically, making the long-term incentive for mutual cooperation greater than the short-term incentive for defection is enough of a change to make cooperation stable. A game with a future offers players an incentive-higher payoffs in the long run for mutual cooperation than mutual defection, as well as means to sanction a previous defection.⁴⁵⁾

4. Strategies of Reciprocity

A strategy is a direct or indirect course of action, consisting of a series of maneuvers, to reach an objective at a cost that is significantly less than the benefits to be gained. It is defined by judgments about what to do, how to do it, and how to limit both the costs and adverse consequences of doing it. In any given game, the number of possible moves and the number of choices for each move remains infinite. Although players do not know how the game will turn out, once each player has chosen a strategy among all the possible strategies available, the course of the game is completely determined.⁴⁶⁾ Therefore a strategy is the simplification of more complex decision making processes.⁴⁷⁾

42) See Ernst B. Haas, "Words Can Hurt You; Or Who Said What to Whom About Regimes, in Stephen D. Krasner, eds., *International Regimes* (Ithaca, N.Y.: Cornell University Press, 1983).

43) Axelrod, *The Evolution of Cooperation*, p. 134.

44) *Ibid.*

45) *Ibid.*, p. 15.

46) Rapoport, *Two-Person Game Theory*, p. 45.

47) According to Duncan Snidal, "a strategy is a complete plan of action, covering all contingencies including random exogenous events as well as endogenous behavior by others." See Snidal, "Game Theory of International Relations," p. 37.

In the prisoner's dilemma, as in all symmetric games, the strategy that works best depends directly on what strategy the other player is using, and in particular, on whether this strategy leaves room for the development of mutual cooperation.⁴⁸⁾ Furthermore, this principle is based on the importance of the next move relative to the current move, making the future important. In general, a strategy is specification of what to do in any situation that might arise, with the situation depending upon the history of the game so far.⁴⁹⁾ First of all, the effectiveness of a strategy depends on the strategy employed by the other participant (for symmetric games). Secondly, "an effective strategy must be able at any point to take into account the history of the interaction as it has developed so far."⁵⁰⁾ These two points illustrate that an effective strategy in an iterated prisoner's dilemma is contingent upon the strategy of the other player.

Axelrod conducted a computer tournament for the study of effective choice iterated prisoner's dilemma.⁵¹⁾ This was because according to Axelrod, there was a need to illustrate "how to play the game well" and a new approach was needed that drew "on people who have a rich understanding of the strategic possibilities inherent in a non-zero sum setting, a situation in which the interests of the participants partially coincide and partially conflict."⁵²⁾ Out of the fourteen strategies submitted, tit-for-tat submitted by Anatol Rapoport won the tournament.

As a strategy, tit-for-tat is dependent on four conditions: (1) unless provoked, the player will always cooperate; (2) if provoked, the player will retaliate; (3) the player is quick to forgive; and (4) the play must be iterated. Although not explicitly mentioned the four conditions naturally indicate that if a player knows that the next play will be the last, it should (will) defect for a higher score. Tit-for-tat starts with a cooperative choice, and thereafter the player does what the other player did on the previous move. This simple, conditional cooperative strategy is probably the most famous strategy for playing the prisoner's dilemma. According to Axelrod, tit-for-tat is successful because it "is nice, forgiving, and retaliatory. It is never the first to defect; it forgives an isolated defection after a single response, but it is always incited by a defection no matter how good the interaction had been so far."⁵³⁾

No other strategy can defeat tit-for-tat if the shadow of the future is large. This is

48) Asymmetric games, such as the ultimatum game and dictator game, have different strategies for each player.

49) Axelrod, *The Evolution of Cooperation*, p. 14.

50) *Ibid.*, p. 30.

51) *Ibid.*, pp.31-54.

52) *Ibid.*, pp. 29-30.

53) *Ibid.*, p. 46.

Axelrod's second proposition on strategy. The shadow of the future is the critical variable for the success and effectiveness of tit-for-tat as a strategy. As Axelrod notes, "any member of Congress who is perceived as likely to be defeated in the next election may have some difficulty doing legislative business with colleagues on the usual basis of trust and good credit."⁵⁰ The same point can also be illustrated with the "live-and-let-live system" of World War I. Although the troops attacked each other when ordered to do so, provided that other side would reciprocate, the troops avoided inflicting harm to one another.

Tit-for-tat received much attention as it scored the highest in Axelrod's tournament. Even second and third place contenders, Joss, Shubik, and Friedman, are close variations on tit-for-tat's simple logic. Both Friedman and Shubik rely on tit-for-tat's simple reciprocity rule but incorporate stronger punishment threats in the event of defection. Although tit-for-tat is often referred to as a "nice strategy," it is prominent to note that it is generally a type of trigger strategy. In playing iterated games, the strategy of grim trigger is commonly considered the most strictly unforgiving strategy. When using grim trigger, a player will cooperate, but as soon as the opponent defects, the player using grim trigger will defect for the remainder of the iterated game. In this sense, tit-for-tat is able to be provoked, but is also forgiving because it will return to cooperation as soon as the other player starts cooperating, therefore it incorporates the most simple and identifiable punishment threat.

Another well-known strategy based on reciprocity is the graduated reciprocation in tension reduction, known simply as GRIT developed by Charles Osgood. Understanding GRIT can be important for this study for it was developed as a process to illustrate how the United States and the Soviet Union could reverse the Cold War spiral of increasing tension by embarking upon conciliatory policies. And therefore, unlike tit-for-tat, GRIT aimed to address a pragmatic situation in international politics. The basic assumption of GRIT is that since the fears of the two superpowers was based on a false premise, conciliatory policies would be able to reduce the suspicion and tension which marred their relationship. Reconciliatory policies are pursued through the implementation of unilateral initiatives that depend on reciprocation for success. The success of GRIT depends essentially on a number of explicit, unilateral steps that indicate a willingness to reduce tension. Even if such actions are not reciprocated immediately, the initiator will continue to take conciliatory steps in other areas of the relationship and explicitly encourage the other state to respond in kind.

Amitai Etzioni further advanced GRIT into a 'gradualist' approach to reducing tension,

54) *Ibid.*, p. 60.

suggesting a three-stage approach to achieving GRIT. According to Etzioni, the first stage involves the initiator embarking upon unilateral 'psychological' measures that will help open communications between the two states, "to calm jittery nerves and tone down the inter-bloc argument so that the sides can again hear what they are saying to each other."⁵⁵⁾ With the success of this stage, the parties can proceed to the subsequent stage. In the second stage, similar unilateral initiatives are taken, but unlike the more symbolic ones of the first stage these will be "comparatively important political and military concessions" which require some form of reciprocation."⁵⁶⁾ Notice that reciprocity is not required until this second stage. Furthermore, the quality and quantity of reciprocity required in this stage is described to be minimal. The final stage, contingent upon the success of the previous stage, will occur when "[s]uspicion and fear [have been] reduced to a level where fruitful negotiations are possible."⁵⁷⁾ Threat reducing measures need to be conducted in a negotiated format, because unilateral initiatives involve only small concessions in case defection occurs.

When the two strategies were tested for efficiency by deploying events data, tit-for-tat was less effective than GRIT.⁵⁸⁾ In U.S.-Soviet relations, the test illustrated that a single shot of cooperation does in fact elicit some reciprocal action, but the response quickly dies out. Strategies with repeated initiatives such as GRIT have greater effect because they allow for a more extensive use of cooperative initiatives and create a greater buildup of cooperative responses. Although studies on GRIT advance the argument on the effectiveness of strategies of reciprocity, unlike tit-for-tat, protection against defection and exploitation are limited, relying solely on the goodwill of the other party. In addition to this, because GRIT does not explain how the time horizon affects the strategy, the build up of cooperative initiatives can be in vain once iteration ends. Although GRIT demonstrates how strategies of reciprocity may apply to real situations in international politics, without the assurance of the future, it is difficult to imagine that two enemies will be willing to engage in a reciprocal relationship. In addition to this, a strategy such as GRIT can have the effect of spoiling the opponent, leaving the burden on one player and the rest of the community to reform the spoiled player.

55) Etzioni, *Hard Way to Peace*, p. 14.

56) *Ibid.*, p. 99.

57) *Ibid.*, p. 102.

58) By incorporating sets of data, COPDAB (Conflict and Peace Data Bank), WEIS (World Events Interaction Survey), allocates behavioral patterns into monthly ups and downs of shifts in levels of cooperation as one nation takes stock of another's recent actions and how it adjusts its own behavior in response. See Joshua S. Goldstein and John R. Freeman, *Three-Way Street: Strategic Reciprocity in World Politics* (Chicago: Chicago University Press, 1990).

Conclusion

The study has described how attaining cooperation is addressed by different theoretical schools of international relations. Among them, we have examined neoliberal notions on cooperation, with an emphasis on the possibility of mutual gains through compromises and arrangements suggesting an optimistic picture of cooperation, and examined Axelrod's use of the game analogy to assess the *evolution of cooperation*. Axelrod's evolutionary approach to cooperation was based on three fundamental predispositions: (1) cooperation can get started even in a world of unconditional defection, given that interaction is iterated and cooperation is based on reciprocity; (2) strategy based on reciprocity can thrive in a world where many different kinds of strategies are being tried; and (3) cooperation, once established on the basis of reciprocity can protect itself from invasion by less cooperative strategies. His analyses on the propositions were based on a reciprocal strategy of tit-for-tat and illustrated the dynamics of reciprocity in a mixed-interest game. On reciprocity, Axelrod offers two pieces of advice; (1) teach people to care about each other; and (2) teach reciprocity.⁵⁹⁾ In order to broaden further understanding of cooperation in international relations, it will be necessary to study the denotations on these two advices.

59) For Axelrod's advice on promoting and sustaining cooperation, see Axelrod, *The Evolution of Cooperation*, pp. 126-141.