BASIC ASSUMPTIONS IN GAME THEORY AND INTERNATIONAL RELATIONS

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(*Abstract*) The application of *game theory* to international politics with an increasing popularity provides a very useful tool in order to explore different dynamics of International Relations. Thus, the aim of this paper is to display the main patterns of *game theory* as an instrument for the study of International Relations (IR). It will describe elementary *game theoretic* assumptions as a vital part of IR*s*, rather than present calculations and examples of the mathematics of *game theory*. In fact, the paper will tackle International Relations' scholars and theoreticians, rather than those who can articulate *game theory* mathematical language. In conclusion, the paper sums up with some general remarks on the subject matter.

Key Words: *International Relations; Game Theory; Realism; Neo-liberalism; Utility; Rationality.*

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1. International Relations and Game Theory

International relations, as commonly denoted from various angles, relate with the interactions among specific actors which range from individuals to nation-states, international organizations, and multinational corporations. International relations are strategic and interdependent and furthermore imply methods how one entity's acts in the international system affect another entity's outcome and *vice versa*. Hence, it follows that *game theory*, whose main objective is the formalized analysis of decision-making procedures and relationships among two or more actors, can assist international relations theoreticians and practitioners in the field in order to explain the interactions among the actors it considers. *Game theory* provides specific means not only for understanding different realities but also means in order to influence interactions with broad benefits.

In an attempt to shed light on these complex networks of strategic interactions and basically in order to explore the relations between IR*s* and *game theory*, the paper focuses on some main IR*s* assumptions, *game theory* assumptions pointing the *Prisoner's Dilemma* and the concepts of *utility/information/rationality and strategies*.

1.1. IR Assumptions

A common assumption in the field of international relations is the fact that choices of actors are interdependent. The interdependence of actions leads to a so-called strategic reasoning which becomes quite complex and difficult to unlock even for many simple interactions. Game theory unfolds a comprehensive method that allows in-depth explorations of different political, social and economic interactions. Given the actors' basic preferences related to respective utility and given their strategic environment, game theory helps us to infer how they rank the various actions at their disposal and furthermore it helps us to determine the expected outcomes of the interplay of specific choices.

In the discipline of International Relations there are competing theories or theoretical perspectives. In this context, Realism is a specific approach of international politics that stresses the competitive and conflictual aspects of the international system. According to Realist assumptions, the state is the key actor in international politics and relations among states are the core of international relations. It is usually contrasted with idealism or liberalism, which has a general predisposition to emphasize non-state actors and cooperation. Contrary to Liberalist claims, Realist assumptions consider the principal actors in the international arena to be states, which are mainly concerned with their security needs and act in the pursuit of their own national interests furthermore continuously struggling for more power.

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Among the founding fathers of Realism we can mention, Thucydides, Machiavelli and Hobbes. Nowadays, classical realism has been largely concurred by neo-realism, which is an attempt to construct a more methodical approach to the study of international relations. However, both the assumptions of classical realism and neo-realism have been subject to criticisms from theorists representing liberal, neo-liberal and post-modern perspectives of International Relations.

On the other hand, after the Cold War, one could witness the growing importance of international and non-governmental organizations, in addition to multinational corporations. These developments led to a revival of specific conceptions which became known as neo-liberalism or pluralism approaches in IR. While accepting some basic assumptions of realism, the leading pluralists, Robert Keohane and Joseph Nye, have proposed the concept of complex interdependence to describe the more sophisticated picture of global politics.

The majority of neoliberal analyses relied on the so-called rational choice and game theory models, borrowed from the economics grounds. Neoliberals nowadays believe that engaging states in different international and non-governmental organizations and institutions can increase communication and cooperation among them. Moreover, this dynamics can increase the costs associated with violence and aggression. The best formulation of neoliberal hopes can be found in the "democratic peace" theory (IRTheory, n.d). According to this principle, two mature democracies have never fought a war against each other. In these terms, promoting liberal democracy around the world will have the general effect of decreasing war.

1.2. Game Theory Assumptions

1.2.1. Introducing; -Games

The situation of competition can be described as a decision-making procedure based on the assumption of actor rationality under complex circumstances. Rationally, each actor tries to maximize gains or minimize losses under conditions of uncertainty and incomplete information, which requires each actor to rank order preferences, estimate probabilities, and try to determine and predict what the other actor is going to do.

In game theory, the two-person zero-sum game, what one actor wins the other loses; if X wins 10, Y loses 10, therefore the sum is zero. In the situation of a two-person non-zero or variable sum game, gains and losses are not necessarily equal. In this kind of games, it is possible that both sides may gain. These games are sometimes referred to as positive-sum games. In some games both parties can lose to a different degree. The so-called n-person games include more than two actors in play. Dealing with the problems and implications of game theory is a central concern for much of the literature on international relations, regional integration, and conflict resolution (Viotti and Kauppi, 1987).

In game theory, a game matrix represents a strategic situation in terms of choices that must be made simultaneously. This is referred to as the normal form of the game. To analyze sequential choices, game theory ordinarily uses extensive-form games i.e. game "trees". However, it is possible to convert any extensive-form game into a normal-form game that preserves the structure of the extensive form in which rows and columns represent plans for how to play the extensive-form game from beginning to end (Stone, 2001, p.217).

One simple method to explain a game is by listing the players participating in the game, and for each player, listing the alternative choices called actions or strategies available to each player. In cases of a two-player game, the actions of the first player form the rows, and the actions of the second player are shown in the columns of a so-called matrix. The entries in the matrix are two numbers representing the utility or payoff to the first and second player respectively. A very famous game is the Prisoner's Dilemma game. In this game the two players are partners in a crime who have been captured by the police. The police have no evidence to convict the pair on the principal charge. They plan to sentence both to a year in prison on a lesser charge. At the same time, each suspect is placed in a separate cell and offered the opportunity to confess the crime. The game can be represented by the following *matrix of payoffs*:

	Not confess	Confess
Not confess	6,6	-3,10
Confess	10,-3	1,1

Note that higher numbers represent more utility. If neither suspect confesses, both of them will only serve a lesser charge (one year in prison) which we represent by 6 units of utility for each suspect. However, if one prisoner confesses and the other does not, the prisoner who confesses testifies against the other in exchange for going free and gets the entire 10 units of utility, while the prisoner who did not confess goes to prison and which results in the low utility of -3. If both prisoners confess, then both are given a sentence and each of them serves 2 years in prison -which we represent by giving each 1 unit of utility. Hence, the outcome obtained when both confess is worse for each {(1.1)} than the outcome they would have obtained if both remained silent {(6.6)}.

Beyond of what we call 'games' in our common language, such as soccer, chess or poker, Game Theory includes the modeling of conflict among nations, political campaigns and trading behavior in different markets. In this context, IRs deal with the interactions among different actors which include nation-states and non-nation entities, international organizations and multinational corporations. It follows that game theory, whose objective is the formalized analysis of relationships among two or more actors, can assist international relations theoreticians in explaining the interactions among the actors it considers (Correa, 2001).

1.2.2. Utility

Every agent in play is by definition an entity with preferences. Game theorists describe these preferences by means of an abstract concept called utility. This refers to some ranking, on some particular scale of the subjective welfare or change in subjective welfare that an agent or an actor derives from an action, event or an object. For example, we might evaluate the relative welfare of countries by reference to their per capita incomes. In the case of people, it is most typical in economics and applications of game theory to evaluate their relative welfare by reference to their own implicit or explicit judgments of it. This is why we referred above to subjective welfare (SEP, 2010).

1.2.3. Games and Information

All situations in which at least one agent can only act to maximize his utility through anticipating (either consciously, or just implicitly in his behavior) the responses to his actions by one or more other agents is called a game. Agents involved in games are referred to as players. If all agents have optimal actions regardless of what the others do, as in purely parametric situations or conditions of monopoly or perfect competition we can model this without appeal to game theory; otherwise, we need it.

1.2.4. Rationality and Strategies

There is a basic assumption that players have capacities that are collectively referred to in the literature as 'rationality'. Each player in a game faces a choice among two or more possible strategies. A strategy is a given 'programme of play' that informs on what actions to take in response to every possible strategy that other players might use. A crucial aspect of the specification of a game involves the information that players have when they choose strategies.

Simple games are those in which agents have perfect information, meaning that at every point where each agent's strategy tells the player to take an action, the agent/player knows everything that has happened in the game up to that point. What makes the situations more complex is the fact that in the real life we do not have perfect information about the strategies of other players/agents. This makes the IR very complex and full of risk. What agents in games believe, or fail to believe about each others' actions makes a considerable difference to the logic of our analyses.

Concluding Remarks

The application of Game Theory to international politics has an increasing popularity and it provides an excellent tool for studying different dynamics of International Relations (IR). Countries do act strategically in order to be active but also in order to prosper and maximize the gains in the international arena. What is fundamental to strategic analysis is not just referring to military or economic affairs but basic conceptions on how we understand politics among states is also very important. The aim of Game Theory lies in expanding the realm of the 'rational-actor' beyond the confines of the Realist approaches to a more complex and inter-dependent world where we are more concerned about the cooperation and less exclusively for the conflict.

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