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**“HOW IT IS POSSIBLE TO AVOID THE THERMONUCLEAR HOLOCAUST?  
GAME THEORY APPLICATION TO CUBAN MISSILE CRISIS.”**

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## ABSTRACT

Game Theory application to International Relation, which especially refers to the field of “International Strategy,” has been defined by Thomas Schelling as a “late science.”

How it is possible to explain this?

Speaking about “strategy,” we consciously limit our research field, especially if we start from the prerequisite of the actors’ rational behaviour, which means that they put into practice intelligent actions and that they are led by a calculation of their advantages. In this way it is not easy to apply the contingent results, and the different conclusions to which we arrive are just an estimation or a deformation of reality.

Several scholars have tried to formulate policies based on strategic questions in order to face compelling problems but they had inadequate help from an already existing theoretical system so that they sometimes had to create a new one. The main reason is that those who dealt with strategic ideas didn’t worry about the construction of a theoretic structure, since they were faced with an instant set of problems. It is also difficult to say if politics studios have focused on the resolution of these problems or on the creation of a suitable methodology which was indispensable to solve those problems. The other fundamental explanation, in which game theory application to international relations has often been inadequate, is that this is a theory which considers that all the actors, or players, making simultaneous choices and only looking after the maximization of their expected utility. On the contrary, how Waltz teaches us, in the concrete world there are several factors which influence players’ choices: they can be ethical, moral, social factors or simply they can refer to human common sense. It was exactly a big amount of common sense which led to the behaviour and the choices of the two presidents in opposition, Kennedy and Khrushchev, during the famous Cuban missile crisis.

The aim of my thesis is precisely that of analysing the Cuban crisis by applying to this international event the game theory and, as it is possible to read in the third chapter, in particular explaining MAD equilibrium between USA and USSR through an extent form game. I’ve divided my work into three sections and each section has been in turn divided in three or four paragraphs.

Chapter one focuses on the rationality theory: this represents the theoretical basis of game theory since one of the most important assumptions is that the involved players

are intelligent and rational. I've underlined the origins of this theory, its limits and I've also taken into consideration how this theory could be applied to political situations. The second chapter is entirely centred on game theory: I've analysed the origins of this theory, the main concepts, and how different games are structured in order to explain different situations and their forms. Finally I've highlighted its application to international relations, focusing on the main situations in which this theory could be adopted. The third and last chapter is indeed based on my case study: the Cuban Missile Crisis. First of all I've explained the historical data, I've made an excursion of what happened during the terrible thirteen days in October 1962, reporting the main speeches of the protagonists of this event and also a remarkable part of one Memorandum by CIA ; secondly I've considered the diplomacy of the Cold War, the phase of deterrence and that of compellance, and finally I've tried to explain, using the game theory, the so called "balance of terror" or, Mutual Assured Destruction balance, kept by the two super-powers during those days.

## CHAPTER I

### RATIONAL CHOICE THEORY AND ITS ROLE IN POLITICAL SCIENCE.

#### 1.1 Rational choice theory: origins, generally accepted assumptions and main features.

Since my thesis is fundamentally based on the “Theory of Games”, I think that it’s essential to start my work introducing the problem of the rational choice. The theory of games, in fact, proposes to describe players’ rational choice in strategic interaction situations, which are those situations in which one player’s behavior can modify the behavior and/or the welfare condition of another player. In the field of the theory of games, the term “rational choice” has a technical meaning which is extremely precise.

This term, according to Myerson<sup>1</sup> is based on two characteristics that are typical of the players: intelligence and rationality. A player can be considered rational if he has complete and transitive preferences about the consequences of his actions and if he tries to choose, among all the available actions, the action or the actions which assure him the best result. On the other hand, a player can be considered intelligent if he possesses logical capabilities that allows him to individualize, without making mistakes, the action or the actions that assure him the best result, among the available ones.<sup>2</sup>

The fact that in the rational choice theory, the term “rational” has a really accurate meaning, has also been underlined by one of the most important scholars of this field, Herbert Simon, winner of the Nobel prize for economics in 1978. It’s also possible to say, as Sudgen<sup>3</sup> pointed out, that this concept of rationality has a characteristic of instrumentality. At this proposal he mentioned Hume: “Reason is and ought only to be slave of passions”<sup>4</sup>. Consequentially reason can be considered as an instrument to reach goals that aren’t produced by the same reason and, if an action isn’t the best way to reach those aims, than it is irrational.

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<sup>1</sup> R. Myerson (1991), *Game Theory: Analysis of Conflict*, Harvard University Press, p.1

<sup>2</sup> F. Colombo (2003), *Introduzione alla teoria dei giochi*, Carocci Editore, pp. 15-16

<sup>3</sup> R. Sudgen (1991), *Does the random-lottery incentive system elicit true preferences? An experimental investigation*, *The American Economic Review*, p.753

<sup>4</sup> D. Hume (1740), *Treatise on Human Nature*, pp. 413-415

Since the early 20<sup>th</sup> century, rational choice theory has become the paradigmatic way of analysing behaviors: its status has evolved as its traditional structure has been morphed by the analysis of data from experimental efforts to test its assumptions. Rational choice theory has deep roots in economics and has become the foil for the development of a cognitive theory of choice in psychology. It has made important inroads in sociology, political philosophy and in political science as a whole: sociologists and political scientists tried to build theories around the idea that all action is fundamentally “rational” in character and that people calculate the likely costs and benefits of any action before deciding what to do. We can consider the rational choice theory as a sort of “mixture” of three things at the same time: it is both a normative and an empirical theory of individual behavior, and also a formalized logical structure that serves as the foundation for many theoretical assumptions in political science and economics.<sup>5</sup> Essentially it ties individual choices to preferences, underscoring choice as teleological or purposeful behavior. It claims both that we ought to behave purposefully in accordance with our values, and also that we do behave so, although not all rational choice theories encapsulate all these three elements.

If we want to focus our attention on rational choice theory’s role in political theory, it is important to underline that it is built on dual foundational presumptions that explaining individual behavior is the key to understand the function of political institutions and that these behaviors can be aggregated to understand the behavior of the entire group. These presumptions fit well with the ideological justification of democratic political systems and are usually referred to the “methodological individualism”. This means that complex social phenomena can be explained in terms of elementary individual actions of which they are composed. John Elster, one of the most important scholars of this standpoint, asserted that “The elementary unit of social life is the individual human action. To explain social institutions and social change is to show how they arise as the result of the action and interaction of individuals”.<sup>6</sup>

Where economic theories have been concerned with the ways in which the production, distribution and consumption of goods and services is organized through money and the market mechanism, rational choice theorists have argued that the same general principles can be used to understand interactions in which such resources as time,

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<sup>5</sup> J.A. Oppenheimer, *Rational Choice Theory* for The Sage Encyclopedia of Political Theory, p.2

<sup>6</sup> J. Elster (1989), *The cement of society*, Cambridge University Press, p.13



information, approval and prestige are involved. In rational choice theory, individuals are seen as motivated by the wants or goals that express their preferences. They act within specific, given constraints and on the basis of the information that they have about the conditions under which they are acting; at the same time, the relationship between preferences and constraints can be considered in the purely technical terms of the relationship of a means to an end. As it is not always possible for individuals to achieve all of the various things that they want, they must also make choices in relation to both their goals and the means for attaining these goals: sometimes individuals must anticipate the outcome of alternative courses of action and calculate that which will be best for them. In general rational individuals choose the alternative that is likely to give them the greatest satisfaction.<sup>7</sup>

Although the origins of rational choice theory may be a bit murky, its modern roots stem from the age of reason: it can be brought back to the masterpiece of Thomas Hobbes, “The Leviathan”(1651). Hobbes tried to explain the basic functioning of political institutions through individuals choices, conjecturing that choices stemmed from universally held “appetites” and “aversions”. At the same time, the father of the modern economics theory, Adam Smith, emphasized the potential social functionality of Hobbes. In his famous “Wealth of Nations”, he affirmed, “It is not from the benevolence of the butcher, the brewer, or the baker that we expect our dinner, but from their regard to their own interest”<sup>8</sup>. Utilitarians went on to formalize the link between individual choice and social welfare through a reduction of moral content to an interpersonally comparable utility numéraire that was seen as also motivating the individual. Speaking about the utilitarian program, which is often referred to as consequentialism, we have to say that by the end of the 19<sup>th</sup> century, preference was stripped of its presumptive interpersonal comparability. At this point, it’s compulsory to make reference to Vilfredo Pareto who outlined one of the first distinctions about rational and irrational actions, that he called “logical” and “illogical” ones. By disparaging the notions of utility, he reduced the power of utilitarian framework in moral matters. Pareto “optimality” is based on the concept that if one can make others

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<sup>7</sup> J. Coleman (1973), *The Mathematics of Collective Action*. London, Heinemann

A. Carling (1992), *Social Divisions*. London, Verso.

A. Heath (1976), *Rational Choice and Social Exchange*. Cambridge University Press

<sup>8</sup> A. Smith (1776), *The Wealth of Nations*. Penguin Classics New York (1986), p.119

better off, without hurting anyone, only then is there an indisputable possibility of improvement for the group. This is a criteria extraordinarily closely related to both “efficiency” and “unanimity”, which has become an almost universally standard accepted normative.

Rational choice theory is based on a series of general assumptions, accepted by the major part of scholars. The first axiom about which there is widespread agreement among rational choice theorists is that rational action involves “utility maximization”: this means that a person, when confronted with an array of options, tends to pick the one she believes best serves her objectives. Olson affirmed that actions are rational when a person’s objectives are “pursued by means that are efficient and effective for achieving these objectives”<sup>9</sup>, given her beliefs.

Rational behavior is typically identified with “maximization of some sort”, as Arrow<sup>10</sup> puts it, even if there is scant agreement among rational choice theorists on just what is maximized and how, if at all, this utility should be measured. There can be in fact forms of strategic behavior that are not maximizing, as is illustrated in Herbert Simon’s contention that people do not seek the best alternative in any feasible set. Without any doubt, these theorists agree that certain consistency requirements must be part of the definition of rationality: these requirements are in fact seen as essential to a science of rational action. “Unless economic units act in conformity with some rational pattern, no general theory about what would follow from certain premises would be possible” (Rothschild 1946)<sup>11</sup>.

Following the lead of microeconomists, rational choice theorists of politics have sought to keep their consistency requirements minimal, but two appear to be widely accepted. First, it must be possible for all of an agent’s available options to be rank-ordered. This is something called “assumption of connectedness”<sup>12</sup> and it requires that an agent regard any two available outcomes as either unequal or equal. It does assume the possibility of rank-ordered preferences over all available outcomes for every individual. Rational choice theorists also assume that preference orderings are transitive: this assumes nothing about the intensity of preferences or the amount by which the different

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<sup>9</sup> M. Olson jr. (1965), *The Logic of Collective Action: Public Goods and the Theory of Groups*.

<sup>10</sup> K.J. Arrow (1963), *Social Choice and Individual Values*. New Heaven Yale, p.13.

<sup>11</sup> *ibidem*

<sup>12</sup> J. Scott (1995), *Sociological Theory: Contemporary Debates*. Cheltenham

outcomes are valued in comparison with one another. Transitivity requires only minimal consistency within preference orderings. When the connectedness and transitivity requirements are both met, we have what Arrow described as a weak ordering of preferences. This is generally assumed to be axiomatic of rationality. Third, rational choice theorists routinely assume that each individual maximizes the “expected value” of his own pay-off, measured on some utility scale (Luce and Raiffa)<sup>13</sup>. The focus on expected rather than actual utility is required by the fact that decision making often takes place under conditions of uncertainty. The assumption of expected utility maximization is usually justified by reference to Von Neumann and Morgenstern’s theorem (1947)<sup>14</sup>. Using weak assumptions about rational behavior, they demonstrate that for a decision maker whose choices among outcomes and gambles follow certain assumptions of consistency, there is a way to assign utility numbers to the various outcomes so that a person would always select an option that maximizes expected utility (Myerson)<sup>15</sup>.

A fourth assumption that affects many rational choice theorists is that the relevant maximizing agents are individuals. Unlike evolutionary biologists who have debated for many years over whether the basic unit of survival is the species, the group, the individual, the gene, or other entities, rational choice theorists of politics generally agree that it is by reference to the maximizing actions of individual persons that collective outcomes must be explained. Buchanan and Tullock<sup>16</sup> declare that collective action is nothing more than “the action of individuals when they choose to accomplish purposes collectively rather than individually”, so that for them the state “is seen as nothing more than the set of processes, the machine, which allows such collective action to take place”. Riker and Ordeshook<sup>17</sup> argue that we are bound to assume the existence of individual preference orderings and individual choices among alternatives as our basic theoretical building blocks in the study of politics. Likewise, Elster contends that because the mechanism through which rational choice explanations operate is the

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<sup>13</sup> R.D. Luce and H. Raiffa (1957), *Games and Decisions: Introduction and Critical Survey*. Dover Publications, p.50.

<sup>14</sup> J. Von Neumann and O. Morgenstern (1953), *Theory of Games and Economic Behavior*. Princeton, NJ. Princeton University Press.

<sup>15</sup> R. Myerson (1991), *Game Theory: Analysis of Conflict*, Harvard University Press, p.2

<sup>16</sup> J.M. Buchanan and G. Tullock (1962). *The Calculus of Consent: Logical Foundations of Constitutional Democracy*, p.2.

<sup>17</sup> W.H. Riker and P.C. Ordeshook, *A Theory of The Calculus of Voting*. The American Political Science Review Vol. 62, No. 1 (Mar., 1968).

preferences and beliefs of individuals, rational choice explanations cannot be predicated upon entities other than individuals. Riker goes so far as to suggest that consistent generalization in the social sciences is possible only when “the central propositions are about rational decisions by individuals”. But it is also sometimes said that rational choice theory is not necessarily individualist in its assumptions, that political parties are assumed, for example, to be maximizing agents in theories of electoral competition, and that nation-states are treated as the basic maximizing units by game theorists of international relations. However, the rational choice literature has generally followed Olson’s individualist account.

In the field of rational choice theory, we can make a distinction between the “Classical preference theory” and the “Modern rational choice theory”. Modern microeconomics and public choice, as well as much of political science and political theory is based on what we might refer to as classical preference theory. In this conception, theorems are derived from the formal properties of preferences that are usually asserted to have the following formal properties:

1. PAIRWISE- people preference judgements are made in pairwise comparisons.
2. COMPLETENESS- all alternatives from which one chooses are comparable.
3. TRANSITIVITY- allows two pairwise relations to be inherited by a third pair in the following fashion: if the relation is transitive the if  $X$  relates to  $Y$ , and  $Y$  relates to  $Z$ , then  $X$  relates to  $Z$ .
4. REFLEXIVE- any alternative is as good as itself.
5. MAXIMIZATION- individuals are presumed to always choose their most preferred alternative.
6. STABILITY- the preference orders are stable over time and scenarios. Preference independence requires that scenario doesn’t add or subtract elements that directly affect the value of the alternatives to the individual.
7. UNIQUENESS- individuals have but one preference ordering.

Together these seven properties imply that we can explain an individual’s choice behaviour by understanding their preferences and the alternative consequences of the choices from which the choice is being made. Between 1930 and 1940, Von Neumann<sup>18</sup> expanded these presumptions so as to cover choices of alternatives that were associated

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<sup>18</sup> J. Von Neumann and O. Morgenstern (1953), *Theory of Games and Economic Behavior*. Princeton, NJ. Princeton University Press.

with probabilistic rewards. Calling such alternatives “gambles” or “lotteries”, he presumed people had preferences over gambles. He then expanded the properties to show that they could reasonably imply that rational choice led to outcomes associated with the highest expected value. In this way, Von Neumann presumed all the above assumptions plus:

- A. REDUCIBILITY- the form of the lotteries makes no difference: only the probabilities of receiving each of the possible outcomes matters.
- B. CONTINUITY- Consider a person who prefers  $X$  to  $Y$  to  $Z$ . Then a lottery can be constructed between  $X$  and  $Z$  that the person will find of equal value to the sure bet of getting  $Y$ .
- C. MONOTONICITY- a person faced with two gambles that involve the same the same two alternatives always prefers the lottery with the higher chance of getting the more preferred outcome.
- D. SUBSTITUTABILITY- a person is indifferent between a lottery and another which has elements that are of equal value to the individual at the same probability.

These four additional presumptions, made by Neumann, imply that people have preferences over outcomes and are risk neutral. They are indifferent to the form of the risks by themselves, only caring about the calculable probability of receiving each particular outcome.

The classical theory had considerable success, and considerable limitations. But as with other empirical claims, its longevity was bound to its empirical accuracy. And as the claims of theorists utilizing classical theory increased and required testing, virtually each of those assumed properties was subject to testing. These tests were often inspired by the failures of extensions of rational choice theory to non-market behaviour.

At this point we can consider the “Modern rational choice theory”. The first one who underlined the fact that we are able to understand preference theory by its empiricism, was Samuelson<sup>19</sup> (1938). But it was the early experimentalists that showed first the smoke...and then the fire. In 1954 Kenneth May<sup>20</sup> showed through a simple survey of

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<sup>19</sup> P.A. Samuelson, *A Note on the Pure Theory of Consumer's Behaviour*. New Series, Vol. 5, No. 17 (Feb., 1938).

<sup>20</sup> M.O. Kenneth (1954), *Intransitivity, utility, and the aggregation of preference patterns*, *Econometrica*.

students that people frequently held intransitive preferences; this discovery was then analysed thoroughly by two psychologists, Kahneman and Tversky. New forms of preference theory cropped up that involved other aspects of preferences that had been shown to violate the classical view, allowing for inconsistent choice over time, framing effects, probabilistic preferences and more.

But the most fundamental alternative to the classical model of rational choice, was developed by a couple of polymaths working in evolutionary biology and developing game theoretic models: Maynard Smith and George Price<sup>21</sup>. Worrying about biological outcomes understood as outcomes of a long repetition of a type of interaction, they conjectured that the interactions that were more successful would lead to more “rewards” and a higher probability of off-spring survival, thereby generating an evolutionary model of strategic development in a population. For them choice became probabilistic and adaptable. And the models that were developed, referred to as evolutionary game theory, changed in both form and foundation, from what we earlier called classical rational choice theory to what has become the theory of evolutionary games. The introduction of this to political science was carried forward by Axelrod<sup>22</sup>(1984). In his work, the interaction of choice that was seen as repeating and over which evolution developed in most of this analysis was that of a two-person “prisoner dilemma game”. (Bendor and Swistak, 2001).<sup>23</sup>

## **1.2 Limits of rational choice theory, heuristics and alternative visions of rationality.**

The fact that people act rationally has, of course, been recognised by many sociologists, but they have seen rational actions alongside other forms of action, seeing human action as involving both rational and non-rational elements. Speaking about rationality, it is

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<sup>21</sup> J.M. Smith and G. Price (1973), *The Logic of Natural Conflict*, Nature vol.246.

<sup>22</sup> R. Axelrod (1984), *The Evolution of Cooperation*. Basic Books New York.

<sup>23</sup> J. Bendor and P. Swistak (2001), “*The Evolution of Norms*”. American Journal of Sociology n. 106 (6 may 2001).

important to make a distinction between two kinds of approaches: “normative theories” and “descriptive theories”<sup>24</sup>.

Normative theories are prescriptive ones: they identify standards, rules and principles to define a rational behaviour. According to those theories in fact, the term rational can be considered that behaviour which responds to determinate criteria of rationality. The model of reference of these theories is that of the “homo economicus”, better known as the already seen rational choice theory. The normative approach affirms that people are rational if they act in a certain way that goes to maximize their welfare, choosing their actions on the basis of a probabilistic calculus between costs and benefits. Meanwhile, descriptive approaches of rational behavior start from the empirical observation of what individuals do, and then infer individual preferences. Because the individual is assumed to be rational, what he does is supposed to correspond to what he prefers. In other words, rational behavior reveals individual preferences. On the other hand, normative approaches of rational behavior formally assume preferences, and then deduce behaviors that are consistent with such preferences. When a non-consistent behavior is observed, it is referred to as “irrational”.<sup>25</sup>

The philosophical stance of the descriptive approach is that individual rationality is not only concerned with the *consequences* of actions, but also by the processes by which these consequences are reached: the *actions* themselves. Individuals might prefer some actions *per se* over others and in practice, these preferences combine with preferences over consequences. We propose the idea that treating procedural concerns as preferences provides a meaningful integration of consequential and procedural views. According to Sen “the need to combine procedural concerns with those of actual events and outcomes is quite strong”<sup>26</sup>.

Experimental investigations have shown a “discrepancy” between these two approaches of rationality. In particular, behavior violating Expected Utility theory or Game Theory as normative frameworks has been observed repeatedly. Two examples of such violations are the Allais paradox (Expected Utility theory) and the Prisoners' Dilemma

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<sup>24</sup> M. Le Menestrel (July 1998), working paper “*Towards an integration of Descriptive and Normative Approaches of Rationality with Procedural Preferences*”.

<sup>25</sup> Briggs, Rachael, “Normative Theories of Rational Choice: Expected Utility”, *The Stanford Encyclopedia of Philosophy* (Fall 2014 Edition), Edward N. Zalta (ed.)  
URL=<<http://plato.stanford.edu/archives/fall2014/entries/rationality-normative-utility/>>.

<sup>26</sup> A. Sen (1995), “*Rationality and Social Choice*”. *American Economic Review*, vol.85 no.1 (march 1995), p.15.

(Game Theory). The major parts of experiments which have demonstrated that normative theories of rationality are not always working in explaining human behavior, regard exactly the “Expected Utility Theory”, formulated by John Von Neumann and Oskar Morgensten in 1944<sup>27</sup>. We must often make decisions under conditions of uncertainty. Expected utility theory is an account of how to choose rationally when you are not sure which outcome will result from your acts. Its basic slogan is: “choose the act with the highest expected utility”<sup>28</sup>. The expected utility theory is a normative theory—that is, a theory of how people should make decisions. In classical economics, expected utility theory is often used as a descriptive theory—that is, a theory of how people do make decisions—or as a predictive theory—that is, a theory that, while it may not accurately model the psychological mechanisms of decision-making, correctly predicts people's choices. The expected utility of an act is a weighted average of the utilities of each of its possible outcomes, where the utility of an outcome measures the extent to which that outcome is preferred, or preferable, to the alternatives. The utility of each outcome is weighted according to the probability that the act will lead to that outcome. If there are two alternatives, that we can call *X* and *Y*, the choice *X* will be preferred to the *Y* one, only if *X* expected utility is superior than *Y* expected utility.

The “Expected Utility” theory is based on four main axioms:

- 1) PREFERENCES’ TRANSITIVITY.
- 2) PREFERENCES’ INDEPENDENCE.
- 3) DOMINANCE.
- 4) INVARIANCE.

Expected utility theory sometimes makes faulty predictions about people's decisions in many real-life choice situations however, this does not settle whether people should make decisions on the basis of expected utility considerations. First of, when acting, people tend to violate the transitivity postulate and also the independence one, and this was pointed out by Tversky and Kahneman (1982)<sup>29</sup>. The main reason of this violation

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<sup>27</sup> J. Von Neumann and O. Morgenstern, *Theory of Games and Economic Behavior*, Princeton, NJ. Princeton University Press, 1953.

<sup>28</sup> *ibidem*

<sup>29</sup> A. Tversky and D. Kahneman (1974),”*Judgment under Uncertainty: Heuristics and Biases*”. *Science* Vol. 185 no. 4157 (27 sept 1974).



is that normative theories don't take in consideration the psychic effect of uncertainty that sometimes prevails over a rational vision: human mind, in an uncertain condition, is able to reason in a sequential and dichotomous way. According to some studios, especially Hayek and Simon, the rational choice theory doesn't attach importance to a series of elements, particularly two:

- Loss of complete information compared with the problem that people have to face with;
- Perception and memory of different situations and choices that misrepresent the reality

It's time to speak about the descriptive approach, which was created in the economics field, around 1960-70 and that developed in conjunction with the work of some cognitivist psychologists. This tendency, which tries to understand why people, in their daily life, distance themselves from logical and rational principles, was introduced by Tversky and Kahneman, in the early 1970s, when these two scholars introduced two fundamental concepts: the *heuristics* and the *biases*, as their consequences. In cognitive psychology, heuristics are simple rules, or strategies, which people use to form judgments and make decisions. They are mental shortcuts that usually lead to focus on one aspect of a complex problem and ignoring others<sup>30</sup>. These rules can lead to a systematic deviations from logic, probability or rational choice theory. The outcome mistakes are called "cognitive biases" and nowadays, very different types have been discovered. Tversky and Kahneman demonstrated fundamentally the existence of three heuristics that underlie a wide range of intuitive judgments. These findings set in motion the "Heuristics and Biases" research program, which studies how people make real-world judgments and the conditions under which those judgments are unreliable<sup>31</sup>. This research is particularly important because it challenged the idea that human beings are rational actors, but provided a theory of information processing to explain how people make estimates or choices. This research, which first gained worldwide attention in 1974 with the Science paper "Judgment Under Uncertainty: Heuristics and Biases"<sup>32</sup>,

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<sup>30</sup> A. Lewis, *The Cambridge Handbook of Psychology and Economic Behaviour*. Cambridge University Press (7 feb 2013), p.43.

<sup>31</sup> D. Kahneman and G. Klein (2009), "Conditions for intuitive expertise: A failure to disagree". *American Psychologist*, pp. 515-526

<sup>32</sup> D. Kahneman (2011), *Introduction of Thinking, Fast and Slow*. Farrar, Straus and Giroux.

has guided almost all current theories of decision-making.

Although a lot of research has focused on how heuristics lead to errors, they can be seen as rational in an underlying sense. According to this perspective, heuristics are good enough for most purposes without being too demanding on the brain's resources. Another theoretical perspective sees heuristics as fully rational in that they are rapid, can be made without full information and can be as accurate as more complicated procedures. By understanding the role of heuristics in human psychology, marketers and other persuaders can influence decisions. In their initial research, Tversky and Kahneman proposed three kinds of heuristics:

- 1) **AVAILABILITY HEURISTIC.** The availability is the ease with which a particular idea can be brought to mind. When people estimate how likely or how frequent an event is on the basis of its availability, they are using the availability heuristic.<sup>33</sup> It is a mental shortcut that relies on immediate examples that come to a given person's mind when evaluating a specific topic, concept, method or decision. It operates on the notion that if something can be recalled, it must be important, or at least more important than alternative solutions which are not as readily recalled.<sup>34</sup> Under the availability heuristic, people tend to heavily weigh their judgments toward more recent information, making new opinions biased toward the latest news. This heuristic is one of the reasons why people are more easily swayed by a single, vivid story than by a large body of statistical evidence.<sup>35</sup>
- 2) **REPRESENTATIVENESS HEURISTIC.** This is used when people use categories, for example when deciding whether or not a person is a criminal. An individual thing has a high representativeness for a category if it is similar to a prototype of that category. "Representative" is here meant in two different senses: the prototype used for comparison is representative of its category, and representativeness is also a relation between that prototype and the thing being

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<sup>33</sup> A. Tversky and D. Kahneman (1973), "*Availability: A Heuristic for Judging Frequency and Probability*". *Cognitive Psychology*.

<sup>34</sup> A. Esgate and D. Groome (2005), *An Introduction to Applied Cognitive Psychology*. Psychology Press, p.201.

<sup>35</sup> A. Tversky and D. Kahneman (1973), "*Availability: A Heuristic for Judging Frequency and Probability*". *Cognitive Psychology*.

categorized. Tversky and Kahneman defined representativeness as “the degree to which [an event] is similar in essential characteristics to its parent population, and reflects the salient features of the process by which it is generated”.<sup>36</sup>

- 3) ANCHORING AND ADJUSTMENT HEURISTIC. It is a heuristic used in many situations where people estimate a number. According to Tversky and Kahneman’s original description, it involves starting from a readily available number, the “anchor”, and shifting either up or down to reach an answer that seems plausible.<sup>37</sup> In Tversky and Kahneman’s experiments, people did not shift far enough away from the anchor. Therefore the anchor contaminates the estimate, even if it is clearly irrelevant. This is a cognitive bias that describes the common human tendency to rely too heavily on the first piece of information offered when making decisions. Once an anchor is set, other judgments are made by adjusting away from that anchor.

At this point it is important to consider some alternative visions of the rationality that take the cue from the heuristics’ studies. First of all we have to underline the theory of the Nobel prize Herbert Simon, who has been considered the “prophet of rationality” and formulated the concept of “Bounded rationality”, in order to express individual behaviours which were in contrast with the normative approach. His idea is that the normative rationality can be considered as a sort of “olympic” one, a characteristic which only divinities possess, since the human being doesn’t refer just to perfect calculus criteria. According to Simon it’s impossible to maximize our objectives because when people act, they just try to look for a satisfied solution. Bounded rationality expresses the idea that, in decision-making, individual rationality is limited by the information one has, by the cognitive limitations of one’s mind and by the finite time one has to make a decision. It was proposed as an alternative basis for the mathematical modeling of decision making, as used in economics, political science and related disciplines; it complements *rationality as optimization*, which views decision-making as a fully rational process of finding an optimal choice given the information available<sup>38</sup>. Another way to look at bounded rationality is that, because decision-makers

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<sup>36</sup> ibidem

<sup>37</sup> ibidem

<sup>38</sup> H. Simon (1991) "*Bounded Rationality and Organizational Learning*". *Organization Science*, pp.125–134.

lack the ability and resources to arrive at the optimal solution, they instead apply their rationality only after having greatly simplified the choices available. Thus the decision-maker is one who is looking for a satisfactory solution rather than the optimal one. Simon used the analogy of a pair of scissors, in which one blade represents the "cognitive limitations" of human beings and the other the "structures of the environment"; minds with limited cognitive resources can be successful by taking advantages of pre-existing structure and regularity in the environment.<sup>39</sup> In "*Models of Man*", Simon points out that most people are only partly rational, and are irrational in the remaining part of their actions. He states, "boundedly rational agents experience limits in formulating and solving complex problems and in processing (receiving, storing, retrieving, transmitting) information"<sup>40</sup>. Simon describes a number of dimensions along which "classical" models of rationality can be made somewhat more realistic, while sticking within the vein of fairly rigorous formalization. These include:

- Limiting the types of utility functions
- Recognizing the costs of gathering and processing information
- Possibility of having a "vector" or "multi-valued" utility function

Simon suggests that economic agents use heuristics to make decisions rather than a strict rigid rule of optimization. They do this because of the complexity of the situation, and their inability to process and compute the expected utility of every alternative action. Deliberation costs might be high and there are often other concurrent economic activities also requiring decisions.

Also the Norwegian sociologist Jon Elster proposed an alternative option to the rational choice theory: starting from Simon, Freschi and Caneman's studies, Elster proposed the so called concept of "Imperfect Rationality". According to him the normative vision of rationality, doesn't always describe human beings' behaviour, but it is important to take care of other aspects that lead our reasoning. In his opinion, the idea of rationality is centred on the concept of "willing weakness", as he highlights in the work "Ulysses

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<sup>39</sup> ibidem

<sup>40</sup> H. A. Simon (1957), *Models of Man: Social and Rational*. New York: John Wiley and Sons, Inc.

and the Sirens”<sup>41</sup>. One of the most important characteristics of people is to be weak, on the willing level, so that they yield to their passions when they are in front of a series of events. But he doesn’t reject the idea of rationality at all: Elster, as an individualist, states that, since we are reasonable human beings, we can try to set some correctives to our behaviour. We can take in consideration a passage taken from the Odissey and reported in Elster’s Ulysses and the Sirens. “...but you must bind me hard and fast, so that I cannot stir from the spot where you will stand me...and if I beg you to release me, you must tighten and add to my bonds”<sup>42</sup>. Ulysses was not fully rational, for a rational creature would not have to resort to this device; nor was he simply the passive and irrational vehicle for his changing wants and desires, for he was capable of achieving by indirect means the same end as a rational person could have realised in a direct manner. It was just his predicament, being weak and knowing it, that pointed to the need for a theory of “imperfect rationality”. But how did Ulysses managed not to be captured by the Sirens? As I’ve already said, as a man he lacks will so that he knows that when he will be near those beautiful creatures, he won’t be able to resist and will let himself carry away in the sea. In order to contrast and prevent this hypothetical irrationality, he has to put some restrictions in the present time: we know, in fact, that he made himself tied at the main mast of the ship and put some wax in his sailors’ ears. According to Elster we need to consider our actions along a time frame so that it is possible to anticipate a hypothetical irrational action that we will make in the future.

Finally I want to consider another important alternative vision of rationality, that has been called as “*wertrationalitat*”, proposed by Max Weber<sup>43</sup>. The German sociologist Max Weber proposed an interpretation of social action that distinguished between four different idealized types of rationality. Rationality has been recognized as the major theme in Weber’s work and this idea has a sort of “polymorphous” character. The first, which he called “*Zweckrational*” or *utilitaristic rationality* is related to the expectations about the behavior of other human beings or objects in the environment. These expectations serve as means for a particular actor to attain ends, ends which Weber noted were “rationally pursued and calculated.” The second type, Weber called

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<sup>41</sup> J. Elster (1979), *Ulysses and the Sirens: Studies in Rationality and Irrationality*.

<sup>42</sup> Homwe, *The Odyssey*, translated by Samuel Butler, Book XII.

<sup>43</sup> M. Weber (1949), *On the Methodology of Social Sciences*. Translated and edited by E. A Schill and H. Finch, The Free Press of Glencoe, Illinois.

“*Wertrational*” or *axiological rationality*. Here the action is undertaken for what one might call reasons intrinsic to the actor: some ethical, aesthetic, religious or other motive, independent of whether it will lead to success. The third type was the so called *teleologic rationality*, determined by an actor's specific affect, feeling, or emotion—to which Weber himself said that this was a kind of rationality that was on the borderline of what he considered “meaningfully oriented.” The fourth was finally the *traditional rationality*, determined by ingrained habituation.<sup>44</sup> The advantage in Weber's interpretation of rationality is that it avoids a “value-laden assessment”, say, that certain kinds of beliefs are irrational. Instead, Weber suggests that a ground or motive can be given—for religious or affect reasons, for example—that may meet the criterion of explanation or justification even if it is not an explanation that fits the *Zweckrational* orientation of means and ends. The opposite is therefore also true: some means-ends explanations will not satisfy those whose grounds for action are *Wertrational*.<sup>45</sup>

### **1.3 Rational choice and political theory.**

The rational choice approach to the study of politics, as Jackman<sup>46</sup>, Grofman<sup>47</sup>, and others have noted, is often caricatured by being reduced to one or two of its characteristic assumptions and presented as a monolithic theory that all practitioners are presumed to accept. It is important to say that most practitioners agree on some, but not all, features of the definition of rational choice. As a result, there is no single rational choice theory so that in their work, entitled “Pathologies of rational choice theory: A critique of applications in political science”<sup>48</sup>, D.P. Green and I. Shapiro described the rational choice approach to the study of politics in a way that takes these complexities into account.

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<sup>44</sup> J. Habermas (1948), *The Theory of Communicative Action*, Volume 1; Reason and the Rationalization of Society, Cambridge: Polity Press.

<sup>45</sup> Ibidem.

<sup>46</sup> R. Jackman (1993), *Mass unemployment : international experience and lessons for policy* CEP discussion paper. Centre for Economic Performance, London School of Economics and Political Science, p. 281.

<sup>47</sup> B. Grofman (1993), *Race and Redistricting in the 1990s*, California University, Irvine.

<sup>48</sup> D.P Green and I. Shapiro (2012), *Pathologies of Rational Choice Theory: A critique of Application in Political Science*. Yale University Press, New Heaven and London.

We can make an examination of some of the highlights of classical rational choice contributions to normative and positive theories of politics. These include improved understanding of:

- social cooperation through what is usually referred to as the logic of collective action;
- the behaviour of collective actors, such as unions and governments, through what is usually referred to as social choice theory;
- what might constitute a metric of social or collective well being and hence a yardstick for political performance.

The classical view of rational choice theory has led to numerous contributions to both positive and normative political theory. There are different areas, in the field of politics, in which the rational choice theory has been used to understand a different range of problems.

First of all we can consider the collective action and the political contribution problem.

“If shared interests are to be satisfied, and if satisfying them for one member of the group satisfies the others, then why would rational, self-interested individuals work to get their shared interests satisfied?”. This is a classical puzzle which was, firstly, analyzed by Jean Jacques Rousseau, in his “Discourse on Inequality”, and then some authors, like Mancur Olson<sup>49</sup> and Russel Hardin<sup>50</sup> tried to solve. This is a complex, but at the same time sobering view of how humans solve what can be called the collective action problem. Olson identified the basic conflict between self-interest and any “natural coming together” of individuals to solve group problems. Then Hardin re-took Olson’s relatively complex argument as a simple n-person prisoner dilemma game, which can be thought of as a situation where each person would individually be better off (each player has his dominant strategy) not cooperating but everyone would be better off if they all did cooperate. From this point the analysis moved along two ways: first, it gave us a great number of implications to interpret what to expect in our political behaviours; second, the implications permitted experimentalists to develop an easy set

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<sup>49</sup> M. Olson (1965), *The Logic of Collective Action*. Harvard University Press: Cambridge.

<sup>50</sup> R. Hardin (1971), “*Collective Action as an Agreeable n-Prisoners’ Dilemma*”. Behavioral Science 16 no. 5.

of models to test. In particular way Ledyard<sup>51</sup> pointed out that the “environmental” variables most likely to have sizeable effects on the outcome, are communication and the relative costs of a contribution to the public good.

As we have already said, in a prisoner dilemma, the individual has a dominant strategy to not contribute. The individual, in a not organized group, won't contribute on the basis of the public good alone. This fact led Olson to note that the incentives that lead one to contribute toward the socially desirable supply of a public good, must be something independent of the group and, at the same time, that work in an individualized fashion. As Olson underlined, unorganized groups won't get their shared interests met except as the externality of others activities. But how and why do groups get organized? The deficit of the unorganized, or non-cooperative, outcome that occurs in the group can be roughly thought of as the difference in the aggregate values of the cooperative and non-cooperative outcomes for the members of the group. This gain is the maximum that the group could spend on organizing and still have a net benefit from the organizing effort (Frohlich, Oppenheimer and Young, 1971)<sup>52</sup>.

The analysis gives, at this point, a solid justification for liberal political orders. Of course, there is no nought derived without a normative presumption. In this case, the normative presumption, which we argue is inherent in the justification of democracy, is that it is a good thing for people to get their shared needs met. If we agree with this observation, then it follows that people should have such basic freedoms as press, speech and assembly. That's why, without such freedoms, even the identity, and certainly the aggregate value of the shared interests, will likely remain unknown. Otherwise, the demand for many valued public goods, will neither be manifest nor factored into public decision making. This proactive justification for liberties goes beyond a more traditional justification, which turns on the need for “negative” protections from the governmental intrusion. Generally, individuals will not know that they share interests if they don't have the possibility of free communication.

The size of the group doesn't change the behavioural prediction in a n-person prisoner dilemma. But, if interests are shares, the value of their accomplishment increases.

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<sup>51</sup> O. J. Ledyard (1995), “*Public Goods: A Survey of Experimental Research*”, in *The Handbook of Experimental Economics*. Princeton University Press.

<sup>52</sup> N. Frohlich; J.A Oppenheimer and O.R. Young (1971), “*Political Leadership and the Supply of Collective Goods*”. Princeton University Press.



Therefore, if collective action is to be approximately understood as a n-persona prisoner dilemma, solving the deficit of a larger group is more valued than that of a similarly situated, but smaller group. In the same way, organizing a larger group is more profitable than organizing a smaller one, and if political leaders are somewhat oriented toward the private rewards, they can gain from such efforts, then politics is potentially more profitable in a large group and political competition will be stiffer in larger groups.

Nevertheless, the findings of the empirical tests didn't fully confirm the predictions of the prisoner dilemma game. Noticing individuals contribute more than predicted to public good problems, some researchers, such as Elinor Ostrom and Charles Plott, began to explore aspects of institutional structures that contributed to success in sustaining common property assets. In 1983 Plott showed that the incentives generated by institutional design determined a great deal about the obtaining of shared group outcomes.<sup>53</sup> Working on common property problems that Hardin<sup>54</sup> (1968) believed required privatization of publicly possessed assets, Ostrom similarly found that institutional and environmental details made all the difference in sustainability: when deviant behaviours were easily monitored and when punishment for non-cooperative behaviour was easy, groups solved their public good problems (Ostrom 1990)<sup>55</sup>. From these discoveries emanated a vast prescriptive literature that has had an enormous impact on institutional and policy design. It has led policies to use such market institutions as trading in such different problem areas as environmental, transportation, communication and other policy matters.

But the contributions of rational choice theory to politics theory and institutional design, don't concern only the study of collective action: it was a field that began with the negative findings of Kenneth Arrow (1951), which was fundamental to much of modern constitutional theory. If groups and their behaviour are the aggregation of choice of individuals, and if individuals behave in accordance with rational choice theory, then democratic constitutions can't be designed to generate rational group choices. It is possible to identify some of the implications of Arrow's discovery by

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<sup>53</sup> R.C. Plott, "Externalities and Corrective Policies in Experimental Markets". *The Economic Journal*, 93 (March 1983).

<sup>54</sup> G. Hardin (1968), *The Tragedy of the Commons*. Science v.162.

<sup>55</sup> E. Ostrom (1990), *Governing the Commons: The Evolution of Institutions for Collective Action*. New York Cambridge University Press.

pointing to the problem of group voting cycles. Cycles led in fact to some problems: a rule that leads to a cycle is aggregating a specific pattern of individual choices into differing group decisions depending upon extraneous factors. Simple majority rule exhibits this property when certain patterns of preferences underlie the choices made by individual voters. The cyclic results from those situations undercut any simple assertion that group choice reflects the “will of the group” or that it is somehow better for the group than those that were rejected. The arguments force one to consider rebuilding the theoretical underpinnings that relate popular choice to notions of social welfare<sup>56</sup>.

To illustrate a voting cycle, Arrow constructs an example<sup>57</sup>: some voters with preferences over a set of alternatives and a defined voting procedure that let us identify the winner. In this case the rule will be simply majority rule structured so that the voters consider their options two at time. The winner of each contest survives to “go against” the next undefeated option until only one option is left: the winner of the last contest. What Arrow shows is that majority rule isn’t the problem. Cycles can only be avoided by rules that permit other things we won’t like. So according to Arrow, any pattern of preferences that the voters have, has to be characterised by these following features:

1. Universalism.
2. Positive association: any side can win if it gets enough support and it means that, if the group is unanimous, it will have its own dominant strategy.
3. Independence: the choice between any two alternatives should only reflect the preferences of group members over those alternatives.
4. Ordering: the results of the contests should be transitive<sup>58</sup>.

Of course, not all combined preference patterns lead to cycles with any particular rule, and not all decision rules lead to them either (Sen 2007<sup>59</sup>). But those democratic (i.e. preference aggregation) procedures that do not lead to cycles implicitly involve some presumptive form of interpersonal comparability of preferences and utility. Were preferences totally non-comparable, this would be an arbitrary element of the rule that

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<sup>56</sup> J. A. Oppenheimer, working paper “*Rational Choice Theory*” for Sage Encyclopedia of Political Theory, Robert Adcock ed., Nov. 25th 2008

<sup>57</sup> J.K. Arrow (1951), *Social Choice and Individual Values*. Yale: New Heaven.

<sup>58</sup> *ibidem*

<sup>59</sup> A. Sen (2007), *Identity and Violence: The Illusion of Destiny*. Penguins New York.

could deprive it of its ability to endow the result with normative weight. (Mackie 2003 and Riker 1982)<sup>60</sup>.

Finally, in order to apply the rational choice theory to the field of politics, I think that it is fundamental to highlight the Arrowian analysis that has led to reconsider the link between rational choice and aggregate welfare (Riker 1982, Mackie 2003)<sup>61</sup>. Much of the effort of behavioral economists has been to investigate the link between “utility”, traditionally understood as welfare or happiness, and preferences. The conclusion is that the satisfaction of individual preferences does not generally lead to more individual happiness. Rethinking about the problem of utility and its relation to preferences has led some to focus in more concrete aspects of preference satisfaction, such as that of basic needs (Braybrooke 1987)<sup>62</sup>. Rationalist branches of democratic political theory, led by John Rawls<sup>63</sup> (1971) embraced such a substitution, referring to the goods that satisfied such needs as “primary goods”, even earlier than the behavioural economists and social choice theorists. One of the way that first Harsanyi (1953) and then Rawls initiated (1972), moved beyond the consideration of preference was by reinstating the notion of impartial reasoning in the exploration of individual and social welfare.

These shifts from preference to more “basic” indicators of welfare changed both the presumptions of inter-personal “comparability” and the basic properties that one might expect of the individual welfare measures being incorporated into conceptions of social welfare. The original difficulty with coming to grips with social welfare identified by Arrow is based on the enunciated non-comparability derived from considering preference satisfaction the “be-all” of individual welfare. The tools of social choice were then expanded to consider these sorts of moral reasoning and the tools of experimental economics permitted the conjectures to be tested (Frohlich and Oppenheimer, 1992)<sup>64</sup>. Although there has not been a wholesale rejection of Pareto optimality as a criteria for governmental performance, there has been a resurgence of an investigation of the link between rational individual choice and the social welfare.

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<sup>60</sup> G. Mackie (2003), *Democracy Defended*. Cambridge University Press.

H.W. Riker (1982), *Liberalism Against Populism: A Confrontation Between the Theory of Democracy and the Theory of Social Choice*. Waveland Press.

<sup>61</sup> *ibidem*

<sup>62</sup> D. Braybrooke (1987), *Meeting Needs*. Princeton University Press.

<sup>63</sup> J. Rawls (1971), *A Theory of Justice*. Cambridge: Harvard University Press.

<sup>64</sup> N. Frohlich and J.A. Oppenheimer (1992), *Choosing Justice: An Experimental Approach to Ethical Theory*. Berkeley: California University Press.

At the beginning of this paragraph I've mentioned the work of Green and Shapiro "Pathologies of rational choice" and, in order to conclude the first chapter of my thesis, I think that we can focus our attention to some points of dissension about how the rational choice theory has been applied to the politics. The first area of disagreement concerns the robustness of assumptions about human goals. In what Ferejohn<sup>65</sup> dubs the "thin-rational" account, agents are assumed to be rational only in the sense that "they efficiently employ the means available to pursue their ends. In "thick-rational" accounts, by contrast, "the analyst posits not only rationality but some additional description of agent preferences and beliefs". Some rational choice theorists of politics claim to assume only thin rationality. Riker argues that so long as the consistency requirements of an Arrowian weak ordering are met, any choice can be interpreted as rational.<sup>66</sup> He concedes that this makes the sense in which individuals are self-interested tautological, arguing that it is the formal structure of preferences, not their content, that does rational choice theory's explanatory work. Riker is correct when he says that some rational choice literature in political science, in particular the literature in cycling and instability, depend almost entirely on thin rationality.

A second area of disagreement among rational choice theorists, in the field of politics, concerns the amount of relevant information that agents can normally be presumed to possess and act on. Conventional neoclassical models of market behaviour assume both perfect information and consumers' ability to understand and use that information. These assumptions are unrealistic, all the more so in politics, where voters are reputed to be ill-informed about the leaders and policies among which they are presumed to choose. As a result, many rational choice theorists of politics have moved away from the assumption of perfect information, though they retain the assumption that actors make the most of their imperfect information. Imperfect information arguably reflects the fact that acquiring information is often time-consuming and costly. Downs reasons that any seeker of information "continues to invest resources in procuring data until the marginal return from information equals its marginal costs"<sup>67</sup>. But, as Elster has noticed, such logic leads to a dilemma: the agent has to assess the value of information that he does

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<sup>65</sup> M.T. Ferejohn (1991), *The Origins of Aristotelian Science*. Yale University Press.

<sup>66</sup> H.W. Riker (1990), *Information, participation and choice. An economic theory of democracy in perspective*, p.173.

<sup>67</sup> A. Downs (1957), *An Economic Theory of Democracy*. New York: Harper and Row, p.215.

not yet have in order to determine whether it is worth taking the trouble to gather that information.<sup>68</sup>

What are rational choice theory's conceptions of explanation in politics? First of all we have to consider two basic features: one relates to the type of causal arguments that are considered; the other concerns the universalism to which rational choice theorists aspire. According to Jon Elster the rational choice explanation of phenomena is a "variety of intentional explanation. It requires not only that agents' reasons be causes of the action they rationalize, but also that agents' beliefs and desires, on which those reasons are based, be both rationally held and internally consistent."<sup>69</sup> In the real world of politics, coming up with explanations that can be shown to meet the relevant optimality, consistency, and intentional conditions would be a tall order. It is evident, however, that neither the optimality requirement nor the consistency conditions can be relaxed abandoning the entire rational choice venture. The fundamental problem is that the empirical demonstration of the existence and causal efficacy of intentions is difficult in the best circumstances, and some rational choice theorists have flirted with abandoning the intentionality requirement entirely. McKelvey and Ordeshook argue that political candidates employ complex strategic decision rules, even if the "substantial numerical complexities" required by these strategies make it doubtful that candidates "could ever compute and abide by such solutions"<sup>70</sup>. Likewise, Posner abandons the intentionality requirement when he argues that common law judges make decisions that maximize the efficient production of wealth, but he thinks that they are unaware of this result and that often they do not intend to produce it.

A second assumption about explanation that commands widespread agreement among rational choice theorists concerns their universalist aspirations. Rational choice theorists "are committed to a principle of universality," Ferejohn observes, according to which "[all] agents act always to maximize their well-being as they understand it, based on their beliefs, preferences, and strategic opportunities"<sup>71</sup>. Rational actor theory, Noll and Weingast note, in a similar way "should seek consistency and universality". Rational choice theorists are skeptical that universal theories of politics can be developed

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<sup>68</sup> J. Elster (1986), *Rational Choice*. Oxford: Basil Blackwell, pp. 19-20.

<sup>69</sup> *ibidem*

<sup>70</sup> R.D McKelvey and R. Ordeshook, (1982) *Division of the humanities and Social Sciences*. California Institute of Technology, p. 312.

<sup>71</sup> M.T. Ferejohn (1991), *The Origins of Aristotelian Science*. Yale University Press, p.281.

through the inductive methods that have characterized political science through most of its history. Achen and Snidal contend that “deductive theoretical propositions are of interest because they interconnect with one another”<sup>72</sup>.

At the end I want to focus my attention on the important concept of balance which will be analysed in a deeper way in the second chapter. For many rational choice theorists, the search for theoretical propositions is a search of equilibrium. Ordeshook notes that rational choice theorists “share, knowingly or unknowingly, a common goal: to search for political equilibria.” With characteristic decisiveness Riker declares that in “the absence of such equilibria we cannot know much about the future at all”<sup>73</sup>. Ordeshook explicates the relationship between equilibria and lawlike statements in these terms: “An equilibrium is a prediction, for a prespecified circumstance, about the choices of people and the corresponding outcomes. This prediction generally takes the form if ‘the institutional context of choice is...and if people’s preferences are...then the only choices and outcomes that can endure are....’ Thus, equilibria replace both journalistic interpretations of events and statistical correlations between environmental factors and political outcomes as explanations. In the deepest meaning of the word, the study of equilibria, in game theory, combined with substantive applications, is an attempt to provide causal explanations”<sup>74</sup>.

The rational choice conception of equilibrium was influenced greatly by the work of John Nash (1950). A Nash equilibrium occurs if there is a potentially self-reinforcing agreement whereby each actor “does what is best for her given what others [would] do”<sup>75</sup>. It can be understood intuitively as an agreement from which no party has an incentive to defect. Harsanyi (1986,92) defines it : “A given strategy of a certain player is called a best reply to the other players’ strategies if it maximizes this player’s payoff so long as the other players’ strategies are kept constant. A given combination of strategies is called an equilibrium point if every player’s strategy is a best reply to all

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<sup>72</sup> C. H. Achen and D. Snidal (1989), *The Rational Deterrence Debate: A Symposium*. Rational Deterrence Theory and Comparative Case Studies , p.168.

<sup>73</sup> W. Riker, “*Implications from the Disequilibrium of Majority Rule for the Study of Institutions*” APSR vol.774 no.2 (June 1980), p.443

<sup>74</sup> P. Ordeshook (1986), *Game Theory and Political Theory*, Cambridge University Press, p. 13

<sup>75</sup> A. Przeworski (1991), *Democracy and the market: Political and economic reforms in Eastern Europe and Latin America*. New York: Cambridge University Press, p.20.

other players' strategies"<sup>76</sup>. When people can enter into binding agreements with others, "an equilibrium corresponds to an outcome in which no coalition has the incentive or the means for unilaterally insuring an improvement in the welfare of all of its members. In game-theory terms such an equilibrium is called a core and corresponds in simple voting games to a Condorcet winner" (Ordeshook,1982).

The dominant view among rational choice theorists is that in politics unique equilibria can seldom be identified, though theorists differ on the significance of this fact. For those like Riker it means that political science is "the dismal science". In his view, if determinate predictions cannot be derived from the laws in which equilibrium models are embedded, then the claim that rational choice models amount to anything more than mere empirical generalization has to be abandoned. On the other side, for example, Elster notes that when a model predicts multiple equilibria "it can still help us to eliminate some alternatives from consideration, even if it does not conform to the ideal of eliminating all options but one"<sup>77</sup>. Ordeshook points out that the discovery that no equilibrium exists can be "a clue to what actions and outcomes we can anticipate", and a considerable rational choice literature has developed in an effort to model strategic behaviour in such settings. But, as I've already underlined, I will discuss about the theme of equilibrium, particularly in the field of international relations, in the second chapter.

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<sup>76</sup> J. C. Harsanyi (1986), *Rational Behaviour and Bargaining Equilibrium in Games and Social Situations*. Cambridge Paperblack Library, p.92.

<sup>77</sup> J. Elster (1986), *Rational Choice*. Oxford: Basil Blackwell, p.19.

## CHAPTER 2

### GAME THEORY AND ITS APPLICATION TO INTERNATIONAL RELATIONS.

#### 2.1. Definition, origins and developments.

Game theory is basically the science of strategy, which attempts to determine mathematically and logically the actions that “players” should take to secure the best outcomes for themselves in a wide array of “games”. A game has been defined as a formal model of an interactive situation; it represents whatever situation which involves two or more parts, called “players”, in which a player’s welfare doesn’t depend only on his behavior, but also on that of other players. All the games, in fact, share the common feature of interdependence: the outcome for each participant depends on the choices (strategies) of all. In so-called zero-sum games the interests of the players conflict totally, so that one person’s gain always is another’s loss. More typical are games with the potential for either mutual gain (positive sum) or mutual harm (negative sum), as well as some conflict. According to Myerson’s definition: Game theory is "the study of mathematical models of conflict and cooperation between intelligent rational decision-makers".<sup>78</sup>

In the early years, games theory was only applied to “zero-sum games”, in which the interests of the players conflict totally, so that one person’s gain always is balanced by another person’s loss. After that, as we will see, it began covering different kinds of situations, such as cooperation games, which are those with the potential for either mutual gain (positive sum) or mutual harm (negative sum). Although this theory developed in mathematical studies field, today it is applied to a wide range of behavioral relations, so that it has been considered a sort of “umbrella term” for the logical side of decision science.

As everybody knows, this mathematical theory was invented by the Hungarian scholar John von Neumann who established the foundation for this modern approach to problems of competition and cooperation in his paper of 1928, entitled “Theorie der

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<sup>78</sup> Roger B. Myerson (1991). *Game Theory: Analysis of Conflict*, Harvard University Press, p. 1



Gesellschaftsspiele”<sup>79</sup>. Almost ten years later, when the Austrian economist Oskar Morgensten went to Princeton University, von Neumann’s interest in the theory was refreshed: the result of their active and intensive collaboration during the early years of 1940s was the treatise “Theory of Games and economic behavior”, in which the basic structure of the 1928 paper was elaborated and extended. Ironically it has been noticed by Kuhn and Tucker that if “had von Neumann and Morgenstern never met, it seems unlikely that game theory would have been developed. If von Neumann played both father and mother to the theory in an extraordinary act of parthenogenesis, then Morgenstern was the midwife.”<sup>80</sup>

The crucial innovation of von Neumann, which was at the same time the keystone of his “Theory of Games”, was represented by the assertion and the proof of the “Minimax Theorem”.<sup>81</sup> It regards a game involving two players who play against each other and for which the players’ gains add up to zero: this is the theorem now known as the minimax theorem for two-person zero-sum games<sup>82</sup>. It asserts the existence of a unique numerical value, representing a gain for one player and a loss for the other, such that each can achieve at least this favorable expectation from his own point of view by using a randomized strategy of his own choosing. Such strategies for the two players are termed optimal strategies and the unique numerical value, the minimax value of the game. This is the starting point of the von Neumann-Morgensten solution for cooperative games, where all possible partitions of the players into two coalitions are considered and the reasonable aspirations of the opposing coalitions in each partition measured by the minimax value of the strictly competitive two party struggle between them. This theorem, thanks to von Neumann, was the source of a wide range of technical results, ranging from his extensions of the Brouwer fixed point theorem, to new methods for combinatorial problems.

Even if the game theory has been made mathematically and logically systematic only since 1944, game-theoretic perceptions can be found among commentators going back to ancient times. For example, in two of Plato's texts, the “*Laches*” and the

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<sup>79</sup> Von Neumann, J. (1928) “*Zur theorie der Gesellschaftsspiele*,” *Math. Ann.* 100, p. 295–300.

<sup>80</sup> H.W Kuhn and A.W. Tucker “*J.V. Neumann’s work in the games and mathematical economics*”.

<sup>81</sup> H.W. Kuhn, L. Nirenberg, P. Sarnak (1996). *A Celebration of John F. Nash Jr.*, Volume 2

<sup>82</sup> T.H. Kjeldsen (2001), *John von Neumann’s Conception of the Minimax Theorem: A Journey Through Different Mathematical Contexts Communicated by J. Gray*. Arch. Hist. Exact Sci. 56, pp. 39–68 c Springer-Verlag

“*Symposium*”, Socrates recalls an episode from the “Battle of Delium” that has been interpreted as a situation which can be explained through game theory. Regarding a soldier at the front, who is waiting with his comrades to repel an enemy attack: if the defense is going to be successful, then it isn't very probable that his own personal contribution will be essential. But the case is different if he stays, he runs the risk of being killed, apparently for no gain at all. On the other hand, if the enemy is going to win the battle, then his chances of death will be very high, and now quite clearly to no gain, since the line will be crushed anyway. Basing on this reasoning, it would be better if the soldier ran away than if he stayed at the front risking his own life. Of course, if all soldiers reason this way, since they are in the same situation, then the battle will be certainly lost. Does this give them a reason for staying at their posts? Just the contrary: if all the soldiers are afraid that the battle will be lost, their incentive to get themselves out of harm's way will be greater. And if they believe that the battle will be won, without the need of any particular individual's contributions, they won't be pushed into staying at the front. We can find in this situation an interesting underlying logic. The soldiers are, in fact, not motivated to retreat just, or even mainly, by their rational assessment of the dangers of battle and by their self-interest; rather they discover an interesting reason to run away by realizing that everything that makes sense for them depends on what makes sense for others and that the most reasonable thing is that everybody makes the same decision. If the soldiers really are brave, then the outcome that everybody prefers is to stay at the front and fight. This is a typical case in which the interaction of many individually rational decision-making processes produces an outcome intended by no one.<sup>83</sup>

It could be really interesting to make a historical excursion of what it is now the modern games theory. According to some scholars and officially recognized in 1985, the Babylonian “Talmud” anticipated the modern theory of cooperative games. The “Talmud” is a collection of ancient laws and traditions written around 500 A.D. in which civil and penal law was used as basis for Jewish religion. One of the most important problems faced in this collection is that of the wedding contract: a man has three wives with whom, in the contract, specified that if he died, they would

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<sup>83</sup> Ross, Don, "Game Theory", *The Stanford Encyclopedia of Philosophy* (Winter 2014 Edition), Edward N. Zalta (ed.), URL = <<http://plato.stanford.edu/archives/win2014/entries/game-theory/>>.

respectively receive 100, 200, 300 shekels. However Talmud gives contradictory recommendations:

- if the man leaves a patrimony of 100 coins, the law recommends an equal distribution (100, 100, 100);
- if the patrimony consists of 300 coins, the law recommends a proportional distribution (50, 100, 150);
- if the patrimony consists of 200 coins, law's advice is a real mystery (50, 75, 75).

This religious passage, has been interpreted in rational terms, as a sort of games theory's precursor also by two important scholars: Robert Aumann and Micheal Maschlers in their "Game-theoretic analysis of bankruptcy problem from the Talmud"<sup>84</sup>. According to them, although this kind of rules only regards moral or ethic matters, inside them there is also space for the explanation of strategic behaviors. Torah rules, for example, affirm that if you make an offer and it is accepted, you won't pull it again anymore; these rules assert that you have to bargain in honesty, but don't tell you the amount of your offer. The fact that economics offers are considered a religious commandment, has been highlighted by an American project about fiscal deductions made for charity purposes. We can see how versatile is this theory: it has a clear place also in world's religious vision. While at a "micro" level behavioral rules cover only a little part of human actions because behavioral freedom prevails over rational precepts, at a "macro" level the developed structures but also the same behavioral rules, can be considered as objects of the games theory.<sup>85</sup>

The first attested discussion of games theory has been found in a letter written by James Waldegrave in 1713, in which he gave a "mimimax mixed strategy" solution to a two-person version of the famous "Le Her" card game. This letter was addressed to Pierre Remond de Montmort who, in turn, sent the letter to Nicolas Bernoulli<sup>86</sup>. Nevertheless he didn't expand this result to other games because he was worried about the fact that a mixed strategy couldn't have been an usual action's rule in gambling games. In 1838

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<sup>84</sup> R. Aumann and M. Maschler (1985), "Game-theoretic analysis of a bankruptcy problem from the Talmud". *Journal of Economic Theory* 36, pp. 195-213

<sup>85</sup> S. Hart (2005), "An Interview with Robert Aumann" in *Macroeconomic Dynamics* 9, Cambridge University Press, pp. 55-57.

<sup>86</sup> Waldegrave, J. (1713) Minimax solution of a 2-person, zero-sum game, re-ported in a letter from P. de Montmort to N. Bernouilli, transl. and with com-ments by H. W. Kuhn in W. J. Baumol and S. Goldfeld (eds.), *Precursors of Mathematical Economics* (London: London School of Economics, 1968), 3-9.

the French philosopher and economist Antoine Augustin Cournot wrote “*Recherches sur les principes mathématiques de la théorie des richesses*” (*Researches into the Mathematical Principles of the Theory of Wealth*). In chapter seven, he analyzed the study of a duopoly, presenting a solution that can be considered as a restricted version of the Nash Equilibrium (1950).

The first theorem was published in 1913 by Ernst Zermelo in his article “*Über eine Anwendung der Mengenlehre auf die Theorie des Schachspiels*” also now known as “Zermelo theorem,” about the chess game. It affirms that in a chess game there always exists a strategy which allows the white player to win the match in all the situations, a strategy which allows the black player to win the match in all the situations and finally a strategy which allows both the white and the black player to negotiate.<sup>87</sup>

The period of the late '40s and early '50s was a period of excitement in game theory. The discipline had broken out of its fenced area and began expanding itself. At Princeton, John Nash laid the groundwork for the general “non-cooperative theory” and for “cooperative bargaining theory”. Lloyd Shapley defined a value for coalitional games, initiated the theory of stochastic games, co-invented the core with D. B. Gillies, and together with John Milnor developed the first game models with an infinite number of players. Harold Kuhn reformulated the extensive form and introduced the concepts of “behavior strategies” and “perfect recall”. A. W. Tucker invented the story of the Prisoner’s Dilemma, which has gone inside popular culture as a crucial example of the interplay between competition and cooperation. We can see how game theory was still in construction, in spite of von Neumann’s opinion that the book contained a rather complete theory.<sup>88</sup>

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<sup>87</sup> Zermelo, E. (1913) “*Über eine anwendung der Mengenlehre auf die the- orie des Schachspiels*” Proceedings, Fifth International Congress of Mathematicians, vol. 2, 501–4.

<sup>88</sup> H.W Kuhn and A.W. Tucker (2004), “*J.V. Neumann’s work in the games and mathematical economics*”, Princeton University Press.

## 2.2 What is a game? main concepts of game theory.

### 2.2.1 Nash equilibrium

”If everyone competes for the blond, we block each other and no one gets her. So then we all go for her friends. But they give us the cold shoulder, because no one likes to be second choice. Again, no winner. But what if none of us go for the blond. We don’t get in each other’s way, we don’t insult the other girls. That’s the only way we win. That’s the only way we all get [a girl.]”<sup>89</sup>

The Oscar-winning movie ”A Beautiful Mind”, about John Nash’s story (played by Russell Crowe), contains a scene in which the protagonist explains the concept of equilibrium. The scene represents Nash and his male colleagues who are discussing in a bar about a group of women. There is a blonde woman and some brunettes. Everybody agrees that the blonde is the most beautiful, but it is better to have one brunette for each man than no woman at all. Nash affirms that, supposing that all the men devote their full attention to the blonde, this is not a reasonable strategy combination because it will result in the men neutralizing their efforts with the blonde so that none will be successful. Further, the brunettes feel slighted, so the men have no chance with them either. Instead, Nash suggests that the men ought to ignore the blonde and each should concentrate on a different brunette woman. The situation in which one male chooses the blonde and the others the brunettes is one type of Nash equilibrium.

One of the most important concepts, part of the game theory is obviously that of “Nash equilibrium”, ideated in 1950 by Nash who, in 1994, was awarded the Nobel prize in Economic Sciences with John Harsanyi and Reinhard Selter. According to Aumann:

“[The Nash] equilibrium is without doubt the single game theoretic solution concept that is most frequently applied in economics. Economic applications include oligopoly, entry and exit, market equilibrium, search, location, bargaining, product quality, auctions, insurance, principal-agent [problems], higher education, discrimination, public

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<sup>89</sup> From the movie “*A Beautiful Mind: The Shooting Script*”, directed by Ron Howard, 2001. The movie takes inspiration from Nash’ biography written by Sylvia Nasar in 1998.

goods, what have you. On the political front, applications include voting, arms control and inspection, as well as most international political models (deterrence, etc.). Biological applications all deal with forms of strategic equilibrium; they suggest an interpretation of equilibrium quite different from the usual overt rationalism. We cannot even begin to survey all of this literature here”<sup>90</sup>.

Nash formally defined an equilibrium of a non-cooperative game as a set of strategies, one for each player in the game, such that each player's strategy maximizes his expected utility payoff against the given strategies of the other players<sup>91</sup>. If we can predict the behavior of all the players in such a game, then our prediction will certainly be a Nash equilibrium, otherwise it would violate this assumption of intelligent rational individual behavior. That is, if our predicted behavior does not satisfy the conditions for Nash equilibrium, then there must be at least one individual whose expected welfare could be improved simply by re-informing him to more effectively pursue his own best interests, without any other social change<sup>92</sup>. This of course is true also for Nash equilibria in mixed strategies. But in the latter case, besides his mixed equilibrium strategy, each player will also have infinitely many alternative strategies that are his best replies to the other players' strategies. This will make such equilibria potentially unstable. In view of this fact, “I felt it was desirable to show, that “almost all” Nash equilibria can be interpreted as strict equilibria in pure strategies of a suitably chosen game with randomly fluctuating payoff functions”<sup>93</sup>.

For his doctoral thesis, published in the “Annals of Mathematics,” Nash worked on a full development of the idea of non-cooperative equilibrium. Having formulated the general definition of equilibrium for non-cooperative games, and having demonstrated the general existence of equilibria for such games in his 1950 note, it seemed that Nash had more to do for a dissertation on non-cooperative game theory, other than work out some examples. Indeed, Nash (1951) presented a big number of interesting examples,

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<sup>90</sup> Aumann, R. J. (1987). Game theory. In *The new Palgrave dictionary of economics*, edited by M. Milgate and P. Newman, 460 - 482.

<sup>91</sup> J.Nash (1950), *Non-cooperative games*, Ph.D. thesis, Mathematics Department, Princeton University.

<sup>92</sup> H.W. Kuhn, L. Nirenberg, P. Sarnak (1996), *A Celebration of John F. Nash Jr.*, Volume 2

<sup>93</sup> J. Harsanyi (1973). *Games with randomly disturbed payoffs: A new rationale for mixed- strategy equilibrium points*. International Journal of Game Theory 2, pp. 1 - 23.

illustrating problems which have concerned game theorists ever since, including a game with one Pareto-inefficient equilibrium like the Prisoners' Dilemma, a game with multiple equilibria, and a game with an unstable equilibrium that shows the need for refinements such as perfect equilibrium. Nash (1951) also analyzed a “three-person poker game” in extensive form, where he applied Kuhn's new methodology of studying behavioral strategies (in which randomization occurs at each stage of the game), rather than the mixed strategies of von Neumann (in which each player is supposed to make just one big randomization at the beginning of the game)<sup>94</sup>. But the most important new contribution of Nash was his argument that this non-cooperative equilibrium concept gave us a complete general methodology for analyzing all games. Referring to the other “cooperative” theories of von Neumann and Morgenstern, Nash wrote:

“The writer has developed a ‘dynamical’ approach to the study of cooperative games based on reduction to non-cooperative form. One proceeds by constructing a model of the pre-play negotiation so that the steps of [this] negotiation become moves in a larger non-cooperative game...describing the total situation. If values are obtained [then] they are taken as the values of the cooperative game. Thus, the problem of analyzing a cooperative game becomes the problem of obtaining a suitable, and convincing, non-cooperative model for the negotiation”<sup>95</sup>.

That’s what game theorists call “Nash’s program”, a program which tries to reduce cooperative games to non-cooperative games by means of appropriate non-cooperative models of the bargaining process among the players. This paper in the early 1950’s at first encouraged game theorists to develop cooperative and non-cooperative game theory as largely independent disciplines, with a concentration on cooperative theory. But twenty-five years later they supported a shift to non-cooperative game theory and to non-cooperative models of the negotiations among the players. Nash equilibrium is

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<sup>94</sup> R.B. Myerson (1996), “*Nash Equilibrium and the history of Economic Theory*”, April 1996 revised, March 1999.

URL:<http://home.uchicago.edu/~rmyerson/>

This paper is published in the *Journal of Economic Literature* 36:1067-1082 (1999), which is the only definitive repository of the content that has been certified and accepted after peer review.

<sup>95</sup> J. Nash (1951). *Non-cooperative games*. *Annals of Mathematics* 54, pp. 286 - 295.

characterized by some knowledge and rationality conditions (Aumann and Brandenburger 1995)<sup>96</sup>:

1. Each player is rational and intelligent;
2. Each player knows his payoff's function;
3. Each player knows the other players' effective strategies.

This concept differs from that of iterated elimination of strictly dominated strategies, since it doesn't demand a common knowledge of a player's intelligence and rationality. This is important because it permits one to know the reality in a better way: it is sometimes difficult that a player can know perfectly all the other player's strategies and the game's structure. It is indeed more reasonable that a player just knows his payoff's function. The concept of Nash equilibrium requests that all the players have the same beliefs about strategies' collection that will be adopted and that these beliefs are correct. This means that all the players must have the same beliefs of all the chosen strategies: so there will be only one valid reason. It is said that the expectation is self-enforcing because there won't be any player, who knows his payoff's function, that will have an incentive to deviate unilaterally. The consequence is that an obvious way of playing does exist and it is just "Nash equilibrium"<sup>97</sup>. There are two justifications about the existence of an "obvious" way of playing. First of all we have to consider a philosophical justification which explains the prescription's uniqueness through the so called "Harsanyi doctrine"<sup>98</sup>. According to these idea, different players who have the same information have to confer inevitably the same subjective probability to a certain event. In a "perfect information" game in fact, all the players must have the same pieces of information before starting it. According to "Harsanyi doctrine," if a player has some beliefs about the game's strategies, all the other player will have the same common beliefs. The second justification refers to some "extra-game" elements which aren't officially part of the games' formal description but play a crucial role in the orientation of player's beliefs. These elements are:

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<sup>96</sup> Aumann R.J. , Brandenburger A. (1995), *Epistemic Conditions for Nash Equilibrium*, in "Econometrica", vol 63 pp. 1161-80.

<sup>97</sup> F. Colombo (2003), *Introduzione alla teoria dei giochi*, Carocci Editore, pp. 115-122

<sup>98</sup> Harsanyi J.C., Selten R. (1972), *A Generalized Nash solution for Two Person Bargaining Game with Incomplete Information*, in "Management Science", vol.18, pp. 80-106.



1. Non-binding communication among players, also known as “cheap-talk”.
2. The existence of a “convention”, which is a behavioral rules that acts in a freely manner in a society and that is followed by this society’s members.
3. The existence of what T. Schelling calls “focal point”<sup>99</sup>: according to him there are some strategies that are perceived as obvious and uniqueness by the players.

### 2.2.2 Dominating strategy.

Since all players are assumed to be rational, they make choices which result in the outcome they prefer most, given what their opponents do. In the extreme case, a player may have two strategies  $A$  and  $B$  so that, given any combination of strategies of the other players, the outcome resulting from  $A$  is better than the outcome resulting from  $B$ . Then strategy  $A$  is said to *dominate* strategy  $B$ . A rational player will never choose to play a dominated strategy. In some games, an examination of which strategies are dominated leads to rational players could only ever choosing one of their own strategies. We can say that a strategy dominates another strategy if it always gives a better payoff to the considered player, without considering what the other players are doing. It weakly dominates the other strategy if it is always at least as good. Depending on whether "better" is defined with weak or strict inequalities, the strategy is termed strictly dominant or weakly dominant. If one strategy is dominant, than all the others are dominated<sup>100</sup>. In *game theory*, there are two kinds of strategic dominance:

-a *strictly dominant strategy* is that strategy that always provides greater utility to a the player, no matter what the other player’s strategy is;

-a *weakly dominant strategy* is that strategy that provides at least the same utility for all the other player’s strategies, and strictly greater for some strategy.

The elimination of dominated strategies is commonly used to simplify the analysis of any game. The way to proceed is to for each player to erase every strategy that seems

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<sup>99</sup> Schelling T.C. (1960), *The Strategy of Conflict*, Harvard University Press. Cambridge (MA).

<sup>100</sup> Shor, Mikhael, "Dominating Strategy," Dictionary of game Theory Terms, game Theory .net, <<http://www.gametheory.net/dictionary/>>

‘unreasonable,’ which will greatly reduce the number of equilibria. This method is quite easy to use when only strictly dominated strategies are in place, but the elimination of weakly dominated strategies can turn problematic, ending up with a game that does not resemble the original one from a strategic point of view. A good example of elimination of dominated strategy is the analysis of the Battle of the Bismarck Sea. In this game, in fact, Kenney has no dominant strategy (the sum of the payoffs of the first strategy equals the sum of the second strategy), but the Japanese have a weakly dominating strategy, which is to go North (the payoffs are equal for one strategy but strictly better for the other). Since only one of them has a dominant strategy, there is no dominant strategy equilibrium. We have then to proceed by eliminating dominated strategies. As we’ve already mentioned, for the Japanese strategy ‘go North’ weakly dominates strategy ‘go South’: therefore, we eliminate the strategy ‘go South’ for the Japanese. Now that we only consider the Japanese going North, Kenney’s strategy ‘go North’ is strictly dominant over strategy ‘go South’, which will be eliminated. Therefore, “North-North” represents the weak-dominance equilibrium <sup>101</sup>.

		JAPANESE	
		North	South
KENNEY	North	<u>2</u> , <u>-2</u>	2, -2
	South	1, -1	3, -3

<http://www.policonomics.com/lp-game-theory2-dominant-strategy/>

### 2.2.3. Prisoner dilemma

While discussing on “Game theory”, it is fundamental to speak about the most

<sup>101</sup> <http://www.policonomics.com/lp-game-theory2-dominant-strategy/>

important and traditional example of game ever studied: the “Prisoner’s dilemma”.

The prisoner's dilemma is an essential problem in game theory which demonstrates why two people might not cooperate even if it is in both their best interests to do so. It was originally outlined by Merrill Flood and Melvin Dresher working at RAND in 1950. Albert W. Tucker then formalized the game with prison sentence payoffs and gave it the "prisoner's dilemma" name (Poundstone, 1992): he wanted to make Flood and Dresher's ideas more accessible to an audience of Stanford psychologists.

Luce and Raiffa (1957) in their book, “Games and Decisions,” describe the prisoner’s dilemma in these terms: “Two suspect are taken into custody and separated. The district attorney is certain they are guilty of a specific crime, but he doesn’t have adequate evidence to convict them at trial. He points out to each prisoner that each has two alternatives: to confess to the crime the police are sure they have done, or not to confess. If they both do not confess, then the district attorney states he will book them on some very minor trumped-up charge such as petty larceny and illegal possession of a weapon, and they will both receive a minor punishment; if they both confess they will be prosecuted, but he will recommend less than the most severe sentence; however, if one confesses and the other does not, then the confessor will receive lenient treatment for turning state’s evidence whereas the latter will get “the book” slapped at him<sup>102</sup>.”

We can see that there is a fundamental conflict in this situation between each individual’s goals and their common rewards. There are also two basic choices: one is to cooperate, the other choice is to defect, which means to fail to cooperate. The “dilemma” faced by the prisoners here is in fact that, whatever the other does, each is better off confessing than remaining silent. But the outcome obtained when both confess is worse for each than the outcome they would have obtained had both remained silent. It is commonly said that this dilemma illustrates a conflict between individual and group rationality. A group whose members pursue rational self-interest may all end up worse off than a group whose members act contrary to rational self-interest. More generally, if the payoffs are not assumed to represent self-interest, a group whose members rationally pursue any goals may all meet less success than if they had not rationally pursued their goals individually. The best mutual outcomes for both

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<sup>102</sup> Luce, R.D and Raiffa, H. (1957). *Games and Decisions*, New York Wiley, p. 95.

players to cooperate with each other. Cooperation will lead to the most points won by the two players. This means that mutual cooperation is the “Dominating strategy,” although the individual earnings may not be as high as they would be if one player defected. For this reason, the prisoner’s dilemma was defined by Hardin as the “tragedy of the commons”<sup>103</sup>.

A closely related view is that the prisoner's dilemma game and its multi-player generalizations model familiar situations in which it is difficult to get rational, selfish agents to cooperate for their common good. Much of the contemporary literature has focused on identifying conditions under which players would or should make the “cooperative” move corresponding to remaining silent. A slightly different interpretation takes the game to represent a choice between selfish behavior and socially desirable altruism. The move corresponding to confession benefits the actor, without considering what the other does, while the move corresponding to silence benefits the other player no matter what that other player does. Benefiting oneself is not always wrong, of course, and benefiting others is not always morally required, but in the prisoner's dilemma game both players prefer the outcome with the altruistic moves to that with the selfish moves <sup>104</sup>.

		PRISONER 2	
		Confess	Lie
PRISONER 1	Confess	-8 , -8	0 , -10
	Lie	-10 , 0	-1 , -1

<http://www.policonomics.com/lp-game-theory2-prisoners-dilemma/>

<sup>103</sup> Hardin, G. (1968). “*The tragedy of the commons*”. Science, 162, p. 1243-48.

<sup>104</sup> S. Kuhn , “*Prisoner's Dilemma*”, The Stanford Encyclopedia of Philosophy (Fall 2014 Edition),Edward N. Zalta (ed.).  
 URL = <<http://plato.stanford.edu/archives/fall2014/entries/prisoner-dilemma/>>.

## 2.3. Different kinds of games

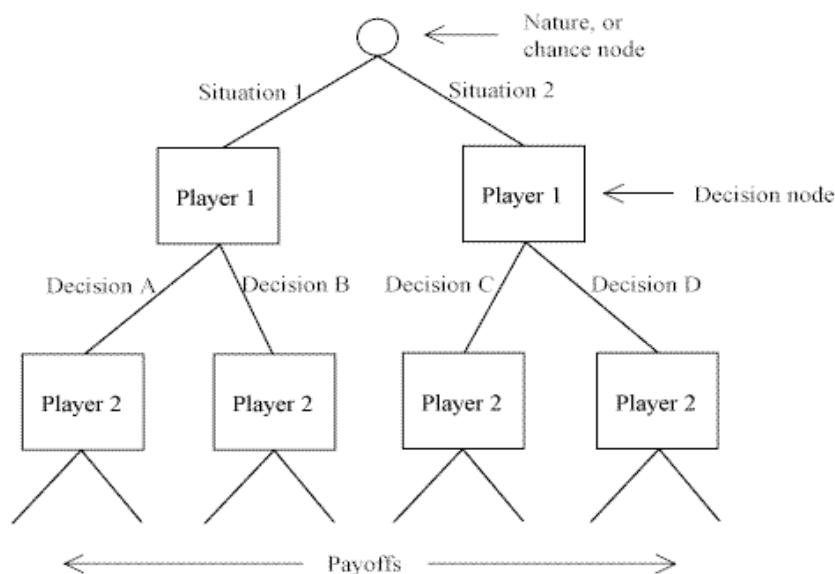
### 2.3.1 Extensive form and strategic form

The game can be described in two different forms: “Extensive form” and “Normal” or “Strategic form,” although the two pioneers of games theory, von Neumann and Morgensten, considered valid only the strategic one by considering that it incorporates all the most important elements of a game. This idea has also been then retaken by Kohlberg and Mertens in their work of 1986<sup>105</sup>.

In the “Extensive form”, the game’s description is made through a “tree-scheme”. A “tree” is a set of nodes and directed edges connecting these nodes. In this way:

1. For each node there is at most an incoming edge.
2. For any two nodes, there is a unique path that connect these two nodes.

This form spotlights the schedule problem: it defines who moves first, which are the actions available for each players in each moment of the game, what each player knows when he moves and finally which are the causes that led a player to a certain point of that game.



<http://www.quickmba.com/econ/micro/gametheory/>

On the other hand, in the “strategic form”, the game’s description is made through a

<sup>105</sup> Kohlberg E., Mertens J.F. (1986), *On the Strategic Stability of Equilibria*, in “Econometria”, vol. 54, pp. 1003-37.

simple chart. The normal form is a matrix representation of a simultaneous game and the most famous example is that of the “prisoner dilemma”. For two players, one is the "row" player, and the other, the "column" player. Each rows or column represents a *strategy* and each box represents the *payoffs* to each player for every combination of strategies <sup>106</sup>.

		PRISONER 2	
		Confess	Lie
PRISONER 1	Confess	-8, -8	0, -10
	Lie	-10, 0	-1, -1

<http://www.policonomics.com/lp-game-theory1-strategic-form/>

In this case all the players simultaneously choose the strategy to adopt before beginning the game. This strategy could also be really complex, since it has to explain a player’s action in all the situations in which he could find himself during the game. A game in strategic form is characterized by:

1. A set of players. [  $i = 1, \dots, n$  ]
2. For each player, a set of possible strategies. [  $S_i$  ]
3. An outcome function which assigns an outcome to every possible combination of strategies. [  $f : S_1 \times \dots \times S_n \rightarrow X$  ]
4. For each player, a utility function which assigns utility to outcomes. [  $u_i : X \rightarrow R$  ]

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<sup>106</sup> Shor, Mikhael, "Prisoner’s dilemma" Dictionary of game Theory Terms, game Theory .net, <[http://www.gametheory.net/dictionary/url\\_of\\_entry.html](http://www.gametheory.net/dictionary/url_of_entry.html)> Web

It is important to underline some elements. Firstly, a player's utility depends not only on his own strategy but also on the strategies played by other players;  $u_i$  is a von Neumann-Morgenstern utility function so that player  $i$  tries to maximize the expected value of  $u_i$ . Finally it is also assumed that the players are  $N = \{1, \dots, n\}$ , that the set of strategies available to each player  $i$  is  $S_i$ , and that each  $i$  tries to maximize expected value of  $u_i$  given his beliefs.

A strong debate about the equivalence of these two forms has been discussed for many years: it is true that the players' rational choice doesn't change whether it is used the extensive or the strategic form? As I've already sketched, von Neumann and Morgenstern affirm that only the strategic form can be considered valid. The implied idea is that if the players know the entire structure of the game, they are able to predict all the future actions in which they could be act so that they should be able to choose their optimal strategy before starting the game. In this case, they argue, there wouldn't be any generalizations' loss if all the players simultaneously choose their strategies at the beginning. In my thesis I will use only the strategic form to apply both the technique of the dominant strategies' iterate elimination (especially for the prisoner dilemma) and to calculate Nash equilibrium.

Before making a precise classification of the different kinds of games, it is important to make a distinction between games with perfect and imperfect information. Another fundamental aspect that we must consider is in fact the amount of information available to the players. First of all we have to introduce the notion of "informative set" which has been defined as a collection of nodes  $\{n_1, \dots, n_k\}$  such that :

1. The same player  $i$  has to move at each of these nodes;
2. The same moves are available at each of these nodes.

These nodes are indistinguishable for the player: When one of the informative set's node has been reached, the player doesn't know which of them it is.

So, it is said, that a game is characterized by "perfect information" when all the informative sets are "singleton": it means that there aren't two or more nodes that belong to the same information set. Perfect information refers to the fact that each player has the same information that would be available at the end of the game. Each player knows or can see other player's moves.

In a game of imperfect information, players are simply unaware of the actions chosen by other players: they know in fact who the other players are, what their possible strategies are, and the payoffs of these other players<sup>107</sup>.

In his general setting, von Neuman's games theory asserts that for a great range of games' category, it's always possible to find a balance point from which no players want to unilaterally stray. This kind of balance does exist in all "two-persons" games that are characterized by the following criteria:

1. The game is finite: this means that there is a finite number of possible options;
2. It is a "zero-sum" game: a player gains exactly what the other loses;
3. It is a "perfect information" game: each player knows perfectly all the available options, the value of each pay-off, his values ladder and that of the other player.

It's not convenient for each player to deviate from such a structured balance because nobody could increase its pay-off and, for rational actors (as underlined in the first chapter) it wouldn't be convenient. In mathematical terms, this means that each player has to find the so called "saddle point". Although Neumann's theorem is only restricted to finite zero-sum games in which there are two players with perfect information, it can surprisingly be applied to a range of games. Even if his merit was that of having furnished a general mathematical structure to face such a similar games, it would be considered a noteworthy mathematical accomplishment: it offers us an explanation of the rational nature of some mysterious concepts, such as "bluff" and it also let scientists to elaborate excellent programmes for poker games<sup>108</sup>.

We can now see the different types of games.

### **2.3.2. Cooperative and non-cooperative games**

The first and main difference is that between "cooperative" and "non-cooperative" or "conflicted" games. We have a pure cooperative games when, for each social situations' couplets, if a player prefers the first strategy to the second one, then all the other players will show the same preference as well. In a cooperative game, players can coordinate

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<sup>107</sup> <http://www.policonomics.com/lp-game-theory1-perfect-imperfect-information/>

<sup>108</sup> L. Mérò (1996), *Mindenki masképp egyforma*, Tericum Kiadó, Budapest. Translated by Elena Ioli in the american edition "Moral Calculations" (1999), pp. 128-130



their strategies and share their payoffs. In this kind of game the actors are “coalitions,” sets of players which can make binding agreements about joint strategies, pool their individual agreements and redistribute the total in a specified way. Cooperative game theory shows how players compete and cooperate as coalitions in unstructured interaction to create and capture value. Cooperative game theory can be applied both to zero-sum and non zero-sum games. It analyses situations where agents can *cooperate* to create value by joining coalitions, but also where agents *compete* to capture value. Cooperative games are also defined in terms of a characteristic function which specifies the outcome that each coalition can achieve for itself. The most famous cooperative game is that of “Battle of Sexes”, which was first studied by R. Duncan Luce and Howard Raiffa, in their 1957 book “Games and Decisions: Introduction and Critical Survey.”

A man and a woman want to get together for a date, but there are only two forms of entertainment in town: a ballet and a baseball match. The woman wants to see the ballet, the man wants to go to the stadium. Even if they have different preferences, both know that they want to spend the evening together. Since the couple wants to spend time together, if they go their separate ways, since the couple wants to spend time together, they will receive no utility and the set of payoffs will be 0,0. If they go either to the ballet or to the baseball match, both will receive some utility from the fact that they’re together, but only one of them will actually enjoy the activity.

If the woman goes to the ballet with her boyfriend, her payoff is 3; her payoff is 0 if she goes to the ballet without him. If the woman goes the stadium with her boyfriend, her payoff is 2; her payoff is 0 if she ends up at the baseball game without him. Similarly for the boy: if he goes to the stadium with her, his payoff is 3; if he goes to the ballet with her, his payoff is 2; finally if he ends up at either place without her, his payoff is 0.

		Woman	
		Baseball	Ballet
Man	Baseball	(3, 2)	(1, 1)
	Ballet	(0, 0)	(2, 3)

<http://2012books.lardbucket.org/books/beginning-economic-analysis/s17-games-and-strategic-behavior.html>

In this case, knowing your opponent's strategy will not help you decide on your own course of action, and there is a chance an equilibrium may not be reached. There are no dominant strategies: for either player, "Baseball" is better if she/he expects the other to choose "Baseball," but "Ballet" is better if she/he expects the other to choose "Ballet." However there are two Nash equilibria: this game can be in fact solved using mixed strategies, in which we look at the probability of our opponent choosing one or the other strategy and balance our pay off against it. These two equilibria are "Baseball, Baseball" with payoffs (2,3) and "Ballet, Ballet" with payoffs (3,2). Each Nash equilibrium reveals how the game should be played<sup>109</sup>.

In case of "non-cooperative" or "conflicted" game, players' interests aren't coincident but they are even counterposed. This kind of game describes in fact situations in which players do not coordinate their strategies. A typical conflicted game example is the "Matching Pennies" game.

Two people choose, simultaneously, whether to show the Head or the Tail of a coin. If they show the same side, person 2 pays person 1 a dollar; if they show different sides, person 1 pays person 2 a dollar. Each person cares only about the amount of money she receives, and prefers to receive more than less<sup>110</sup>. In non-cooperative games, for each social situations' couple, if the first player prefers the first situation to the second one,

<sup>109</sup> <http://www.policonomics.com/lp-game-theory2-battle-of-the-sexes/>

<sup>110</sup> <http://www.econ.brown.edu/faculty/Serrano/textbook/Lesson14PlusGraphs.pdf>

then the other player will prefer the second situation. In this case, we have two opposite preferences.

A particular game, in which cooperation and conflicted situations coexist, is the “Chicken Game”, that I will take in consideration, in the last chapter, in reference to the balance maintained during the Cuban missile crisis. This game came to public attention in the 1955 movie “*Rebel Without a Cause*,” in which Los Angeles teenagers drive stolen cars to a cliff and play a game they call a “chickie run.” The game consists of two boys who simultaneously drive their cars off the edge of the cliff, jumping out at the last possible moment. The boy who jumps out *first* is “chicken” and loses. The plot has one driver’s sleeve getting caught in the door handle. He plunges with his car into the ocean. The movie, and the game, got a lot of publicity in part because the star, James Dean, died in a hot-rodding incident shortly before the film’s release. Dean killed himself and injured two passengers while driving.

Players’ payoffs depend on their preferences, even if it is clear that each of the two players prefers the situation in which he emerge as the only hero and that the worst result is the crush. Finally, it is better be considered as a “chicken” along with your than to be the only one “chicken”<sup>111</sup>. We can see the strategic form of this game as follow:

**Payoff Matrix, Game of Chicken**

	Swerve	Continue
Swerve	+1, +1	+1, 0
Continue	0, +1	0, 0

<http://syntheticdaisies.blogspot.it/2013/10/game-theory-of-shutting-things-down.html>

Also in this case, there isn’t a dominant strategy: each player prefers in fact to swerve if he believes that the other will keep on driving and, in the same way, each player prefers to keep on driving if believes that the other will swerve. Each strategy is compatible

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<sup>111</sup> Poundstone W. (1992), *Prisoner’s Dilemma*, Doubleday, NY 1992, pp. 197-201.

with the hypothesis of the game's structure and player's rationality common knowledge. In this game it is mutually beneficial for the players to play different strategies. The most important concept that we have to underline is that players use "shared information". In coordination games, sharing information creates a benefit for all: the resource is non-rival, and the shared usage creates positive externalities. In anti-coordination games the resource is rival, but non-excludable, and sharing comes at a cost (or negative externality). This unstable and uncertain situation can be formalized by saying there is more than one Nash equilibrium: the two situations in which one player swerves while the other does not <sup>112</sup>.

### **2.3.3 Symmetric and asymmetric games**

Any game in which the identity of the player does not change the resulting game facing that player is symmetric. Each player earns the same payoff when making the same choice against similar choices of his competitors. Symmetric games include forms of many of the common "2x2 games" such as the prisoner's dilemma, game of chicken, and battle of the sexes. In this kind of game, payoffs for playing a particular strategy depend only on the other strategies employed, not on who is playing them. If the identities of the players can be changed without changing the payoff to the strategies, then a game is symmetric. A game is symmetric if the rules do not distinguish between the players. For symmetric games, both players have the same options: the game matrix is in fact square.

Most commonly studied asymmetric games are games where there are not identical strategy sets for both players. For instance, the ultimatum game and similarly the dictator game have different strategies for each player. It is possible, however, for a game to have identical strategies for both players, yet be asymmetric.

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<sup>112</sup> Owen G. (1995), *Game Theory*. 3rd edn. San Diego: Academic Press

### **2.3.4 Zero-sum and no zero-sum games.**

Zero-sum games represent those situations in which one person's gain is equivalent to another's loss, so the net change in wealth or benefit is zero. In a zero-sum game there could be two players as well as millions of participants. They are less common than non-zero sum games: clear examples of these games are "Poker" and "Gambling," two games in which the sum of the amounts won by some players equals the combined losses of the others. If the total gains of the participants are added up, and the total losses are subtracted, they will sum to zero. The zero-sum is a sort of constant sum where the benefits and losses to all players add result in to the same utility. Zero-sum games are also called *strictly competitive*.

In game theory, an example of zero-sum game, is the already cited "Matching Pennies". In game theory, the game of "Matching Pennies" is often cited as an example of a zero-sum game. The game involves two players – let's call them A and B – simultaneously placing a penny on the table; the payoff depends on whether the pennies match or not. If both pennies are heads or tails, Player A wins and keeps Player B's penny; if they do not match, Player B wins and keeps Player A's penny.

This is a zero-sum game because one player's gain is the other's loss.

On the other side "non zero-sum" games represent the major part of situations analyzed by the game theory, such as "Prisoner dilemma", "Chicken Game" and the "Battle of Sexes."

## **2.4 Game theory's application to international relations**

The application of game theory to international relations is quite new but, as noticed by Duncan Snidal, there has been a great increase in the popularity of this approach<sup>113</sup>. Starting in the 1950s, political scientists found game theory quite useful in their analyses. The 1960s, for example, were prolific years in the field of coalitional bargaining, voting, and coalition formation. Economists discovered how powerful the implementation of game theory was much later, in 1980s, especially through a program called "Nash equilibrium refinement". Nevertheless, while game theory became a basic

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<sup>113</sup> Duncan Snidal (1985). *The Game Theory of International Politics*. World Politics, 38, pp 25-57

element in economic analyses, there has been no parallel move in the field of international relations.

Game-theory applications to International relations takes the form of “models,” that is, the simplification and stylization of states’ interactions. We have to consider three levels of game theory: extensive, strategic, and coalitional forms. In an extensive-form model, the analysis is represented in terms of states, which are the players, actions available to players, sequences of players’ actions, players’ information conditions and preferences, and, finally, outcomes of interactions. In a game at the strategic level, there are only players, players’ strategies and preferences over outcomes. The coalitional form is the most abstract level analysis: coalitions of players and the values of these coalitions. The major advantage of game models come through disciplined simplifications of international interactions. The discipline comes out of precisely defined concepts of players, strategies, actions, preferences, and deductions formally derived from basic assumptions and concepts. The term strategy, for example, does not take on different meanings regardless the results. All game theorists around the world would agree upon the meaning of central game-theory concepts and would derive the same results, for example, conditions for equilibrium existence<sup>114</sup>.

As shown by Poundstone<sup>115</sup> (1992), game theory and international relations have influenced each other almost since the publication of “The Theory of Games and Economic Behavior” by von Neumann and Morgenstern (1944), usually considered to be the first systematic and extensive formal analysis of social interactions. Game theory, whose objective is the formalized analysis of relationships among two or more actors, can help international relations theoreticians to explain the interactions among the considered actors. According to Lake and Powell<sup>116</sup> international relations study the interactions between subjects: from this point of view the subject matter of international relations and game theory coincide. Distinctive characteristics of the international relations approach to the analysis of interactions among nation-states include the attention given to their motivation and the power they use to influence each other.

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<sup>114</sup> Powell R. (1999), *In the Shadow of Power: States and Strategies in International Politics*, Princeton, New Jersey, Princeton University Press, pp. 23-39.

<sup>115</sup> Poundstone W. (1993) “*Prisoners’ Dilemma*”, Anchor Books, New York NY

<sup>116</sup> Lake, David H. and Powell R. (1999) “*International Relations: A Strategic-Choice Approach*”, in Lake, David H. and Powell, Robert (eds.), *Strategic Choice and International Relations*, Princeton University Press, Princeton, NJ.

Strange<sup>117</sup> affirms that the area of security and economics are the two main issues considered in the theory but also in the practice of international relations<sup>118</sup>.

A different dimension of international relations' study is indeed based on the fact that the interactions that constitute them generally proceed along well defined lines that we don't use to encounter in interactions among individuals, institutions or neither in the relationship between the government and the nations. As Evans and Newham<sup>119</sup> have noticed, one of the main assumptions of the realist approach to international relations is that nation-states are motivated only by their own interests. Nation-states consider the needs and interests of other nation-states only when they have the capability to enforce their demands by threatening or performing damaging actions. We can consider these observations from the point of view of Game Theory: actors involved are in fact self-centred and just pursue their own satisfaction. According to me this reflects perfectly the concept of the "expected utility." However nation-states consider the needs and interests of other only when these other nation-states have power or can perform dangerous actions, since the determinants of power are the most important factors which influence the actions available to nation-states. It is assumed that these actions are known and that the players can choose any one of them, guided only by their preferences and without restrictions.

As I've already noted, according to many theorists the "cross" between the study of international relations and Games theory focuses particularly on security and defense problems: that's why Game theory was deeply analyzed and was of great interest during the Cold War. The study of security and defense regards several fields and focuses its attention especially on the concept of strategy, defense alliances problems, deterrence and arms, battles during the war. In this last paragraph I will swiftly sketch these topics that will be intensely analyzed in the third chapter with reference to the MAD period.

The concept of strategy is deeply examined in "The Strategy of Conflict" written by Thomas Schelling in 1960. In his work he affirms that the term "strategy" is taken by the theory of games because its aim is that to underline the interdependence of enemies'

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<sup>117</sup> S. Strange (1991) "*What About International Relations*" (3rd. Ed.), Longman Publishing, New York, NY.

<sup>118</sup> Correa H., work paper "*Game Theory as an Instrument for the Analysis of International Relations*".

<sup>119</sup> G. Evans and J. Newnham (1998) "*Dictionary of International Relations*", Penguin Putnam Inc, New York, p. 645.

decisions and their expectations regarding mutual behavior. Although what Schelling defines as the “Strategy theory” takes for granted the idea of conflict, it considers both the existence of conflict interests between participants and that of common interests<sup>120</sup>. But in this particular way, the concept of strategy used by Schelling doesn’t refer to the application of strength but to the utilization of “potential power;” it doesn’t refer to enemies which detest each other but to partners which don’t reciprocally trust each other and don’t agree on several topics; it doesn’t refer to advantages’ division or to possible losses between participants but it considers the possibility that some results will be bad for all the participants. According to Schelling, international conflicts can be considered as “variable-sum games”: the sum of participants’ gains is not fixed but depends on different situations and it is not true that the loss of one is balanced by the other’s gain. In these terms, studying the strategy of conflict means to accept the premise that the major part of conflicted situations are negotiations.

The problem of defense alliances, as pointed out by Gardner<sup>121</sup>, is limited to the ways of how defense costs should be distributed among nation-states which are interested in defending themselves from a common external threat. This distribution is made considering the length of the boundaries of the nation-states which are in contact with enemy territories. It’s clear that all the considered nation-states will benefit in the same way from the protection provided by the alliance. Also Powell<sup>122</sup> made an interesting study of alliances by applying game theory’s assumptions. He analyzed the interactions of three nation-states: two were involved in a direct confrontation that would have probably resulted in war, one had to decide whether to support one side or the other. The analysis of deterrence is probably one of the most studied topics in international relations and especially it has been examined by using game theory. According to Brams and Kilgour<sup>123</sup> nation-states use a policy of deterrence when each of them threatens to retaliate for a possible offense of the other in order to prevent such an offense from occurring in the first place. As a consequence arms races are simply the sequences of events that take place when the nation-states want to increase the

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<sup>120</sup> T.C. Schelling(1960), *The Strategy of Conflict*, Harvard University Press, Cambridge (MA).

<sup>121</sup> R. Gardner (1995) “*Games for Economics and Business*”, John Wiley & Sons, Inc, New York, pp.401-404.

<sup>122</sup> R. Powell(1999) “*In the Shadow of Power*”, Princeton University Press, Princeton NJ, pp. 149-96.

<sup>123</sup> S.J. Brams and M.D. Kilgour(1988) “*Game Theory and National Security*”, Basil Blackwell Inc, New York NY, p.18.



credibility of their threats. Nation-states want to avoid and to protect themselves from a possible destruction or domination: if they have weapons, for example, they will feel more secure but at the same time, since weapons' possession can be used also for an attack, the other nation won't be sure of the intentions of the first. The analysis of battles is indeed much easier than that of war or deterrence because the events are defined in time and space. A clear example of game theory's application to the problem of battles, is given by the already considered "Battle of the Bismark Sea" which involved USA and Japan during the second world war.

There are several factors which influence nations' behaviors in an interdependence situation: first of all we have to consider the problem of understanding preferences. According to Frank Zagare<sup>124</sup>, in an international incident there is, in general, at least an attempt by each side to understand their opponents' preferences and to gain the upper hand with such knowledge. However, as Robert Jervis has shown, interpretations and conjectures made by one nation about another, almost take on a game of their own and therefore need to be explored as much as preferences<sup>125</sup>. Then we have to consider a nation's identity, which essentially means how a country sees itself and its perceived role in the global scheme, because thus preferences often emanate from a country's identity.

But, without any doubts, the primary factor that influences bargaining is the belief system: it affects initial expectations, which influence initial strategy, which in turn, influence any adjustments then made to the strategy throughout the negotiation process. A player's belief system contributes to and amplifies misinterpretations of an adversary's message as well as mistaken estimates of how the adversary is interpreting one's own messages. If each side had perfect information about the other's abilities and resolve then "there would be little to bargain about"<sup>126</sup>. Values and interests make up a central context in which bargaining takes place: they are both inherent to the situation and not fully known to both players at the beginning of negotiations. Values can add perceived legitimacy or justice to a country's actions. For example, the Monroe Doctrine gave the US a platform on which to stand in the Cuban Missile Crisis

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<sup>124</sup> F.C. Zagare(1983). *A Game Theoretic Evaluation of the Cease-Fire Alert Decision of 1973*. Journal of Peace Research n.20, pp. 84-85.

<sup>125</sup> R. Jervis(1988). *Hypotheses on Misperception*. World Politics n.20, pp. 454-479

<sup>126</sup> G.H. Snyder and P. Diesing (1977). *Conflict Among Nations: Bargaining, Decision Making, and System Structure in International Crises*. Princeton, NJ: Princeton University Press, p. 290.

negotiations when it demanded the Soviet missiles be withdrawn. Such legitimacy can strengthen the position of one side and weaken the other's.<sup>127</sup>

Finally, preferences are guided by behavioral norms that are considered acceptable by a player: Snyder and Diesing have discussed norms in terms of constraints to behavior. Applying this concept to the Cuban Missile Crisis, the secret installation of Soviet missiles was an intolerable action: Khrushchev had in fact assured Kennedy that Soviets would have not taken such an offensive action. By installing the missiles, they ignored the long standing Monroe Doctrine and shifted the military balance.<sup>128</sup>

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<sup>127</sup> *ibidem*

<sup>128</sup> C.E. Carrattini (2013) work paper n. 236: "*Cuban Missile Crisis: Applying Strategic Culture to Game Theory*".

## THIRD CHAPTER

### CASE STUDY: CUBAN MISSILE CRISIS

#### 3. 1. Introduction: the cold war.

“ [...] From Stettin in the Baltic to Trieste in the Adriatic, an *iron curtain* has descended across the Continent. Behind that line lie all the capitals of the ancient states of Central and Eastern Europe. Warsaw, Berlin, Prague, Vienna, Budapest, Belgrade, Bucharest and Sofia, all these famous cities and the populations around them lie in what I must call the Soviet sphere, and all are subject in one form or another, not only to Soviet influence but to a very high and, in many cases, increasing measure of control from Moscow.[...]If now the Soviet Government tries, by separate action, to build up a pro-Communist Germany in their areas, this will cause new serious difficulties in the British and American zones, and will give the defeated Germans the power of putting themselves up to auction between the Soviets and the Western Democracies. Whatever conclusions may be drawn from these facts-and facts they are-this is certainly not the Liberated Europe we fought to build up. Nor is it one which contains the essentials of permanent peace. The safety of the world requires a new unity in Europe, from which no nation should be permanently outcast. It is from the quarrels of the strong parent races in Europe that the world wars we have witnessed, or which occurred in former times, have sprung. [...] If the population of the English-speaking Commonwealths be added to that of the United States with all that such co-operation implies in the air, on the sea, all over the globe and in science and in industry, and in moral force, there will be no quivering, precarious balance of power to offer its temptation to ambition or adventure. On the contrary, there will be an overwhelming assurance of security. If we adhere faithfully to the Charter of the United Nations and walk forward in sedate and sober strength seeking no one's land or treasure, seeking to lay no arbitrary control upon the thoughts of men; if all British moral and material forces and convictions are joined with your own in fraternal association, the high-roads of the future will be clear, not only for us but for all, not only for our time, but for a century to come.”<sup>129</sup>

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<sup>129</sup> <http://www.historyguide.org/europe/churchill.html>

The “Sinews of Peace” speech, made by Winston Churchill at “Westminster College” in Fulton on the 5th of March 1946, is certainly one of the most famous and significant speeches delivered by the English leader of the Opposition (1946-1951). The keyword is without any doubts represented by the expression “iron curtain” which, symbolically, marks the beginning of what has been defined by the Bernard Baruch, during his speech to the South Carolina House of Representatives, as the “Cold War”: “Let us not be deceived;” Baruch said, “we are today in the midst of a Cold War. Our enemies are to be found abroad and at home. Let us never forget this: Our unrest is the heart of their success”<sup>130</sup>. This term, used by Walter Lipmann in his New York Herald Tribune column, defines with a strong meaning the state of diplomatic relationships between Western, led by USA, and USSR: relationships that started to be already outlined at the end of the second World War, when the idea of the division of the world in two influence spheres made inroads during the conferences of Yalta and Teheran. From the end of World War II in 1945 until 1991, the U.S. and the Soviet Union competed against each other to demonstrate the superiority of each one’s politico-economic system: democracy and capitalism vs. authoritarianism and communism. All the other states, subjected to one sphere or to the other one, competed through proxy conflicts, whether political (supporting democratic or communist parties), economic (development aid), or military. Initially, the superpowers focused on post-World War II Europe as they tried to win over states to their sides. As the Cold War progressed and dividing lines in Europe were consolidated, the superpowers increasingly focused on the developing world in South America, Asia, and Africa. This splitting up was the cause of several frictions and disputes in the border zones because of political and economics reasons: belonging to one sphere or to another would have provoked serious and long-lasting consequences, not only from a political point of view, but especially from an economic and a social one. The entire world was witness of several expansion’s attempts, put into practice especially by the Communist sphere and also by the newborn Chinese Federal Republic, which tried to expand itself: the most symbolic example was the occupation of Korea, in which USA stepped in the South part of the Asiatic country. This complicated situation took elements of reciprocal suspicious between the two areas with several relevant spy rings, especially in England, USA and USSR in which the fear

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<sup>130</sup> Bernard Baruch, South Carolina Houses of Representatives, Apr 16, 1947.

for the possession of the atomic bomb was felt in an even more strong manner. During these years the two superpowers chanced upon many events in which the entire world was not only due to a theoretical Third World War but especially to a nuclear catastrophe: Berlin block in 1949, Korean War in 1950 and the Cuban Missile Crisis which is the object of this chapter's analysis.

As Jeremi Suri has highlighted, USA and USSR sought to avoid another war, but they also recognized one another as rivals for domination over Europe and Asia<sup>131</sup>. Both sides feared that the other would convert the resources of the new areas under his control into war-fighting capabilities. Both sides feared a loss of access to traditional markets. Most significant, both sides feared that the other would win the 'war of ideas', convincing the devastated populations of Europe and Asia that liberal capitalism or communism was the only legitimate system of governance. What many Americans called 'psychological weaknesses' could leave societies susceptible to subversion from within by propaganda. Ideological conflict between the United States and the Soviet Union, long pre-dating 1945, made the nascent Cold War a contest between worldviews that extended beyond weapons, territory and economics alone. Washington and Moscow could reach agreement on various measures for geopolitical stability, but their ideological clash made a permanent settlement almost inconceivable<sup>132</sup>.

The development of thermonuclear weapons and intercontinental missiles in the 1950s added another chilling dimension to the US-Soviet rivalry. The two states now had the capability to annihilate one another, and most of the rest of the planet, in short order. Their leaders would determine whether humankind survived or vanished in a radioactive firestorm. This was truly 'super' power. No country or community could escape an uncomfortable dependence on the decisions of the two men in control of nuclear arsenals that continued to grow in their terrifying lethality<sup>133</sup>.

A big part of US military environment and American public opinion stood up for taking advantage of military and nuclear supremacy in order to attack and defeat USSR but, on the contrary, human wisdom triumph over armaments. We can clearly understand this

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<sup>131</sup> Jeremi Suri, *Power and Protest: Global Revolution and the Rise of Détente* (Cambridge, Mass., 2003)

<sup>132</sup> Melvyn P. Leffler, *A Preponderance of Power: National Security, the Truman Administration, and the Cold War* (Stanford, 1992), pp. 25–99; Vladislav Zubok and Constantine Pleshakov, *Inside the Kremlin's Cold War: From Stalin to Khrushchev* (Cambridge, Mass., 1996), pp. 36–77.

<sup>133</sup> John Lewis Gaddis, *We Now Know: Rethinking Cold War History* (Oxford, 1997), pp. 85–112, 221–59.

from an article taken from the American newspaper “The New Yorker”.

“ [...] Kennedy had convened an executive committee, also known as ExComm, of government officials to manage the crisis; opinion in the committee ranged from blockade to air strike to Cuban invasion. The President said afterward that the purpose of the alert was to deter a Soviet military response to whatever Caribbean action the USA decided to carry out: “The airborne alert”, he congratulated SAC “provided a strategic posture under which every United States force could operate with relative freedom of action”. General Power saw a more threatening purpose, however; from his point of view, “This action by the nation’s primary war deterrent force gave added meaning to the President’s declaration that the USA would react to any nuclear missile launched from Cuba with a full retaliatory response upon the Soviet Union itself.” While Kennedy was thinking regional engagement under a nuclear umbrella; Power and LeMay were thinking global war. On Wednesday, October 24th, when the naval quarantine took effect, SAC (Strategic air command) ratcheted from (DEFence readiness CONdition) DefCon 3 to DefCon 2- the first and only time it was ever ordered to do so. SAC alerted nuclear weapons increased to two thousand nine hundred and fifty-two; with a hundred and twelve Polaris SLBM’s, their total destructive force exceeded seven thousand megatons. “We got everything we had in the strategic forces...counted down and ready and aimed”, General Burchinal said afterward, “and we made damn sure they saw it without anybody saying a word about it.” In fact, Power said several words about it, unauthorized and publicly, to all SAC wings immediately after the move to DefCon2 was announced “This is General Power speaking. I am addressing you for the purpose of reemphasizing the seriousness of the situation the nation faces. We are in an advanced state of readiness to meet any emergencies, and I feel that we are well prepared. I expect each of you to maintain strict security and use calm judgement during this tense period.” His broadcast was a warning to the Soviets- who Power knew monitored such transmissions- that the United States had gone to full alert and might be planning “further action”. [...] More dangerous was Curtis LeMay’s overconfident and belligerent advice to John F. Kennedy, whom he had believed since at least the stillborn invasion at Cuba’s Bay of Pigs, in 1961, to be a coward. Knowing that USA and USSR were approaching mutual deterrence and that SAC was therefore a wasting asset, LeMay pushed Kennedy to up the ante, bomb Cuba, and take out missile

sites. “The Kennedy administration thought that being strong as we were was provocative to the Russians and likely to start a war,” he said with disgust in retirement. “We in the Air Force, and I personally, believed the exact opposite...We could have gotten not only the missiles out of Cuba, we could have gotten Communists out of Cuba at that time...During that very critical time, in my mind there wasn’t a chance that we would have gone to war with Russia because we has overwhelming strategic capability and the Russians knew it”.

A big part of cinematographic industry was influenced by these terrifying years and many movies succeeded in showing what the public opinion and military rankings’ feelings were. I think it’s interesting to mention, in an ironical but at the same time realistic way, Stanley Kubrick’s movie “Doctor Strange Love: how I learned stop worrying and Love the Bomb”, released on January 29, 1964. Its plot suggested that a mentally deranged American general could order a nuclear attack on the Soviet Union, without consulting the President. Let’s consider another article taken from “The New Yorker”<sup>134</sup>.



“One reviewer described the film as “dangerous ... an evil thing about an evil thing.” Another compared it to Soviet propaganda. Although “Strangelove” was clearly a farce, with the comedian Peter Sellers playing three roles, it was criticized for being implausible. An expert at the Institute for Strategic Studies called the events in the film “impossible on a dozen counts.” A former Deputy Secretary of Defense dismissed the

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<sup>134</sup> THE NEW YORKER, JANUARY 17, 2014 “Almost Everything in “Dr. Strangelove” Was True” by Eric Schlosser.

idea that someone could authorize the use of a nuclear weapon without the President's approval: "Nothing, in fact, could be further from the truth." When "Fail-Safe"—a Hollywood thriller with a similar plot, directed by Sidney Lumet—opened, later that year, it was criticized in much the same way. "The incidents in 'Fail-Safe' are deliberate lies!" General Curtis LeMay, the Air Force chief of staff, said. "Nothing like that could happen." The first casualty of every war is the truth—and the Cold War was no exception to that dictum. Half a century after Kubrick's mad general, Jack D. Ripper, launched a nuclear strike on the Soviets to defend the purity of "our precious bodily fluids" from Communist subversion, we now know that American officers did indeed have the ability to start a Third World War on their own. And despite the introduction of rigorous safeguards in the years since then, the risk of an accidental or unauthorized nuclear detonation hasn't been completely eliminated. The command and control of nuclear weapons has long been plagued by an "always/never" dilemma. The administrative and technological systems that are necessary to insure that nuclear weapons are always available for use in wartime may be quite different from those necessary to guarantee that such weapons can never be used, without proper authorization, in peacetime. During the nineteen-fifties and sixties, the "always" in American war planning was given far greater precedence than the "never."

In retrospect, Kubrick's black comedy provided a far more accurate description of the dangers inherent in nuclear command-and-control systems than the ones that the American people got from the White House, the Pentagon, and the mainstream media. "This is absolute madness, Ambassador," President Merkin Muffley says in the film, after being told about the Soviets' automated retaliatory system. "Why should you build such a thing?" Fifty years later, that question remains unanswered, and "Strangelove" seems all the more brilliant, bleak, and terrifyingly on the mark".

This movie perfectly describes that shell-shock atmosphere that there was almost everywhere, especially in USA where many people (also members of United Nations) were suspected of being Communist, spying and introducing the Communist doctrine in the American territory. A sort of "witch-hunt" began and passed at the name with the famous name of "Maccartism", from Joseph McCarthy who was a republican senator which considered this period as the "second Red Scare" (the first one regarded the period between 1917-1920).



This was a period in which the entire world lost its own clear mind so that was near a global catastrophe as it happened during the Cuban Missile Crisis.

### **3.2 Cuban missile crisis**

The Cuban Missile Crisis was a thirteen-day confrontation from October 15 to October 28, 1962 between the United States and the Soviet Union over the positioning of nuclear missiles in Cuba. In 1962, the Soviet Union secretly placed nuclear-tipped missiles on the Communist-led island of Cuba. The Soviets installed 36 to 42 medium SS-4 medium-range ballistic missiles (MRBMs) in Cuba: six of the missiles were decoy versions to deceive a potential American attack or for use in training. The missiles had a range of 1,100 nautical miles (1,266 miles) and could reach New Orleans, Miami, and Washington, DC. Each missile's warhead had an explosive capacity of about one megaton (the equivalent of one million tons of explosive), more than sixty times the destructive power of the atomic bomb dropped on Hiroshima (which was only 16 kilotons, or the equivalent of 16,000 tons of explosive). Twelve short-range, Luna tactical nuclear missiles were also in Cuba. They had a range of about 17 nautical miles (20 miles) and were designed for use in battle: the Soviets would only use them in the event of an American invasion. Each missile's warhead was delivered to Cuba: these had an explosive capacity of two kilotons (an eighth the size of the weapon used at Hiroshima). Soviet commanders were initially authorized to use these weapons with no further input from Moscow. That changed on October 27th, when the Soviet government instructed them not to be fired without authorization from Moscow. The Soviets also had 80 Sopka-variant cruise missiles in four missile batteries arrayed along the Cuban coast. Many, if not all, of the warheads for these missiles were delivered to Cuba by the beginning of the Missile Crisis on October 14th. Each missile's warhead had an explosive capacity of 12 kilotons (three-quarters of the yield of the bomb dropped on Hiroshima). These missiles had a range of 40 nautical miles (46 miles): they were to be used to counter an American invasion of Cuba <sup>135</sup>.

After discovering the missiles in October, the U.S. responded by blockading Cuba. Following a period of intense discussions and fear of a nuclear catastrophe, President

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<sup>135</sup> <http://www.cubanmissilecrisis.org>

John F. Kennedy made a proposal to Premier Nikita Khrushchev that the Soviet leader accepted; The Soviets withdrew the missiles after the U.S. pledged publicly never to invade Cuba and promised privately to withdraw its own nuclear missiles from Turkey. The Cuban government was initially neutral to the superpower competition. The Soviet Union initially was at first uninterested in Cuba, and Castro even toured the U.S. in 1959. Yet Castro frayed the relationship with America when he threatened, and ultimately undertook, reforms that would harm American-owned property in the country. The increasingly hostile relationship with the U.S. provided an opening for the Soviet Union. Castro formed trade ties with Moscow and as Cuba grew closer to the USSR, relations with Washington deteriorated further. The U.S. revoked its diplomatic recognition of Cuba at the beginning of 1961.

The sixteen months between Kennedy's inauguration in January 1961 and Khrushchev's decision to send missiles to Cuba (which was most likely made in April or May of 1962) had not been good ones for the Soviet Union in general and Khrushchev in particular. This period witnessed the largest peacetime military buildup in U.S. history, the discovery and public disclosure by the Kennedy administration that the infamous "missile gap" (the belief-which was largely the result of Khrushchev's incessant boasting on this subject-that America's strategic arsenal was significantly inferior to the USSR's) was mythical, the continued inability of Khrushchev to increase Soviet citizens' standard of living, the growing belief among Soviet states-men that an American attack on communist Cuba was very likely, and a growing public bid for leadership of the international communist movement by China. Such international and domestic considerations generate two sets of implications that are critical for our purposes. First, at the time Khrushchev made the decision to send missiles to Cuba, he was operating in the domain of losses. Changes in the objective and subjective balance of power, the humiliating way in which Kennedy revealed the missile gap myth, the likely loss of Cuba in the near future, increasing challenges within the international communist movement, and increasing threats to Khrushchev's domestic-political goals all point inescapably to this conclusion. Secondly, sending offensive nuclear missiles to Cuba could very likely alleviate many of these problems. If successful in this gambit, Khrushchev would both shift the strategic balance of power in the Soviet Union's favor and provide, he hoped, a powerful deterrent to an American invasion of Cuba.

Moreover, increasing the Soviet Union's strategic power, especially in such a quick and relatively inexpensive manner, would allow Khrushchev to devote more resources to consumer investment without which his domestic agenda of increasing the standard of living for Soviet citizens would be very difficult to realize <sup>136</sup>.

On the other side, the U.S. had prepared for a possible war in Europe by placing nuclear weapons in allied countries: bombers and ballistic missiles capable of delivering nuclear weapons were intended as a deterrent against a Soviet invasion of Germany and other NATO countries. Nuclear missiles were placed in Turkey, a NATO member that shared a border with two Soviet republics, because of its proximity to the Soviet Union. Many members of EXCOMM argued in favor of a military strike to destroy the nuclear missiles in Cuba before they became operational. President Kennedy, however, did not want to escalate to war so quickly. Instead, he decided to blockade Cuba to prevent the installation of additional Soviet nuclear missiles. While this step did not defuse the crisis, it bought the President time and avoided a direct attack against Cuba.

The famous “thirteen days” represent the most dangerous periods of the entire crisis. On Wednesday, October 17<sup>th</sup>, military units began moving to bases in the Southeastern U.S.; photos from another U-2 flight showed additional sites in which there were almost thirty missiles.

“The SAC commander at that time was Thomas Power, a LeMay protégé, who had been promoted to Air Force Chief of Staff during the Cuban missile crisis. It seems that Power was at least as eager as LeMay to “get World War III started”. “A subordinate commander”, Bundy alerted Kennedy in January, 1961, “faced with a substantial Russian military action could start the thermonuclear holocaust on his own initiative if he could not reach you (by failure of communication at either end of the line)”. When Kennedy began speaking on national television, at seven o’clock, fifty-four SAC bombers, each carrying as many as four thermonuclear weapons, thundered off from continental bases to join the routine twelve-plane around the clock airborne alert. Some of the bombers orbited the Mediterranean, others circumnavigated North America; others flew an Arctic route across Greenland, north of Canada, across Alaska, and down the Pacific Coast on North America; one orbited above Thule to observe and report any

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<sup>136</sup> Haas M.L., Prospect Theory and the Cuban Missile Crisis, *International Studies Quarterly*, Vol. 45, No. 2 (Jun., 2001), pp. 241-270

pre-attack Soviet assault. In this way Kennedy and Khrushchev began an exchange of belligerent messages”<sup>137</sup>.

The following day, Kennedy was visited by Soviet Foreign Minister Andrei Gromyko, who asserted that Soviet aid to Cuba was purely defensive and didn't represent a threat to the United States: USA President, without revealing what he knew about the existence of the missiles, read to Gromyko his public warning of September 4<sup>th</sup>, according to which the "gravest consequences" would have followed if significant Soviet offensive weapons were introduced into Cuba. On Saturday October 20<sup>th</sup>, Kennedy returns suddenly to Washington and after five hours of discussion with top advisers decided on the quarantine. Plans for deploying naval units are drawn and work is begun on a speech to notify the American people.

“ My fellow citizens: let no one doubt that this is a difficult and dangerous effort on which we have set out. No one can foresee precisely what course it will take or what costs or casualties will be incurred. Many months of sacrifice and self-discipline lie ahead-months in which both our patience and our strength will be tested-months in which many threats and denunciations will keep us aware of our dangers. But the greatest danger of all would be to do nothing. The path we have chosen for the present is full of hazards, as all paths are but it is the one most consistent with our character and courage as a nation and our commitments around the world. The cost of freedom is always high but Americans have paid it. And one path we shall never choose, and that is the path of surrender or submission. Our goal is not the victory of might, but the vindication of right-not peace at the expense of freedom, but both peace and freedom, here in this hemisphere, and, we hope, around the world. God willing, that goal will be achieved” <sup>138</sup>.

Prior to addressing the American public on live television, President Kennedy wrote to Nikita Khrushchev: “[...] I have not assumed that you or any other sane man would In this nuclear age, deliberately plunge the world into war which it is crystal clear no country could win and which could only result in catastrophic consequences to the

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<sup>137</sup> Rhodes R., “The General and World War III”, *The New Yorker* (June 19th 1995), p. 47.

<sup>138</sup> Radio and Television Report to the American People on the Soviet Arms Buildup in Cuba. President John F. Kennedy, The White House, Washington. October 22, 1962

whole world. Including the aggressor”<sup>139</sup>.

On the 24<sup>th</sup> of October, Chairman Khrushchev replied indignantly to President Kennedy's October 23 letter stating: "You, Mr. President, are not declaring a quarantine, but rather are setting forth an ultimatum and threatening that if we do not give in to your demands you will use force. Consider what you are saying! And you want to persuade me to agree to this! What would it mean to agree to these demands? It would mean guiding oneself in one's relations with other countries not by reason, but by submitting to arbitrariness. You are no longer appealing to reason, but wish to intimidate us"<sup>140</sup>. On Sunday, October 28<sup>th</sup>, Radio Moscow announced that the Soviet Union had accepted the proposed solution and released the text of one of Khrushchev's letters affirming that the missiles would have been removed in exchange for a non-invasion pledge from the United States.

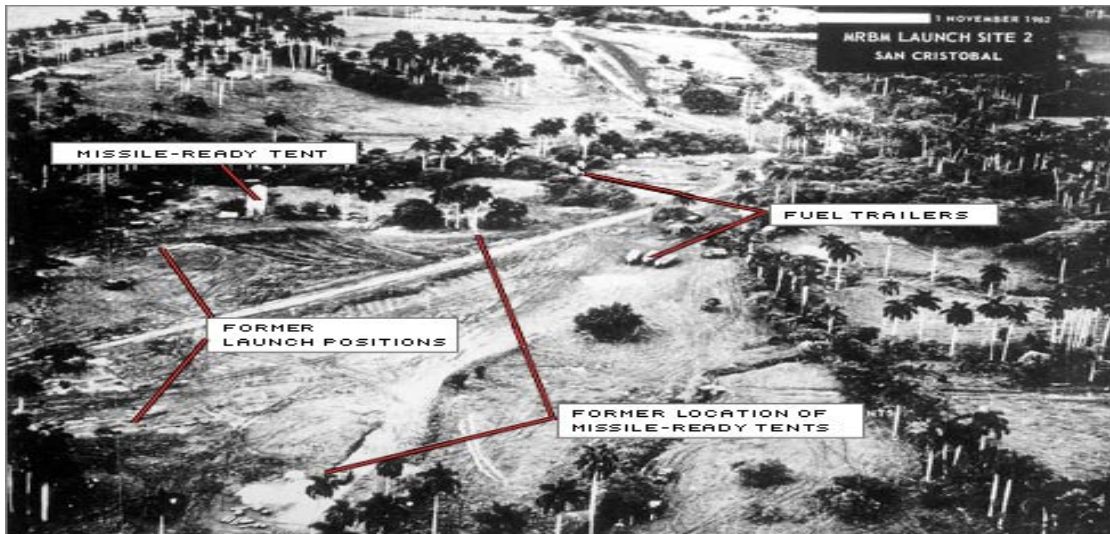
“In order to eliminate as rapidly as possible the conflict which endangers the cause of peace, to give an assurance to all people who crave peace, and to reassure the American people, who, I am certain, also want peace, as do the people of the Soviet Union, the Soviet Government, in addition to earlier instructions on the discontinuation of further work on weapons construction sites, has given a new order to dismantle the arms which you described as offensive, and to crate and return them to the Soviet Union.”  
(Khrushchev's Letter)

Just over a month after the crisis began, on the 21<sup>st</sup> of November, the President terminated the quarantine after the conclusion of tense discussions at the United Nations over the disposition of Soviet nuclear bombers and submarine bases. The U.S. was satisfied with the progress made in dismantling and withdrawing the missiles.

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<sup>139</sup> Letter From President Kennedy to Chairman Khrushchev, The White House, Washington. October 22, 1962.

<sup>140</sup> Letter From Chairman Khrushchev to President Kennedy. Moscow, October 24, 1962.



During my researches, I've found a Memorandum written by the Central Intelligence Agency (CIA) on the 27th October 1962, "THE CRISIS USSR/CUBA" Information as of 0600, which was prepared for the Executive Committee of the National Security Council. This document's release was approved in January 2002<sup>141</sup>. I want to report some parts that I consider be the most interesting for my work. This first section is taken from the "Summary Contents":

- I. Based on the latest low-level reconnaissance mission, three of the four MRBM sites at San Cristobal and the two sites at Sagua La Grande appear to be fully operational. No further sites or missiles have been identified. San Cristobal MRBM Sites 1,2 and 3 Sagua La Grande Sites 1 and 2 are considered fully operational. The remaining MRBM site, #4 at San Cristobal will probably be fully operational on 28 October.
- II. Despite Khrushchev's declaration to US That that Soviet ships would temporarily avoid the quarantine area, we have no information as yet that the six Soviet and three satellite ships en route have changed course. A Swedish vessel, believed to be under charter to the USSR, refused to stop yesterday when intercepted by a USA destroyer and was allowed to continue
- III. No significant redeployment of Soviet ground, air or naval forces have been noted. However, there are continuing indications of increased readiness among some units. Three F-class submarines have been identified on the surface inside or near the quarantine line.

<sup>141</sup> Central Intelligence Agency, Memorandum. The Crisis URSS/CUBA, Information as of 0600 (27<sup>th</sup> October 1962).

The second part of this Memorandum is entitled “The Situation in Cuba”:

- I. The Cuban government is exploiting the arrival of a Soviet tanker in Havana on 26 October to put on a propaganda display designed to demonstrate the “failure of the US blockade”.
- II. The Cuban government is apparently making some attempt to appear conciliatory on the international scene, though Cuban spokesmen continue adamant in their refusal to consider any inspection of Cuban bases by any outsiders.

### **3.3 Diplomacy during the cold war: “the diplomacy of violence as the art of coercion and intimidation.”**

The diplomacy of the Cold War represents one of the fundamental processes of the international system’s functioning during the bipolar period: the Vienna Convention on diplomatic relations, stipulated in 1961, is fundamental to understand how the states related one another. The cold war diplomacy has only one focus: the absolute need of avoiding a global nuclear conflict and that’s why this phase was characterized by several summits between the leaders of the two “super-states”. It is possible to divide this kind of diplomacy into two subgroups: the nuclear diplomacy and the crisis diplomacy. The nuclear diplomacy has two main features:

- *compellence*, also known as coercive diplomacy, is the threat intended to an adversary to do something: states threaten to use nuclear weapons in order to persuade a rival state to give up an already begun unwanted action;
- *deterrence* is the threat intended to keep an adversary from starting something: states threaten to use nuclear weapons to dissuade a rival state not to begin an unwanted action.

This distinction is in the timing and in the initiative, in who has to make the first move, in whose initiative is put to the test. Deterrence thus involves setting the stage—either by announcement, by rigging the trip wire, or by incurring the obligation—and then waiting. The overt act (the attack) is up to the opponent. The stage setting can often be nonintrusive, non hostile, non provocative. The act that is intrusive, hostile, or provocative is usually the one to be deterred; the deterrent threat only changes the

consequences if the act in question—the one to be deterred—is then taken. According to Thomas Schelling, it was just during the 50's that the idea of deterrence was formulated as keystone of American national strategy. A threat, in order to be effective, had to be believable and its credibility derived from its costs and its risks: the considered threat had to be collocated inside a “detonation mechanism” along the enemy's advance line. At the same time, its accomplishment was a question of honor and national prestige, as the case of Formosa Resolution, approved by American Congress on the 29<sup>th</sup> of January 1955: it affirmed US responsibility to defend by force Taiwan from Chinese attacks. Schelling underlines that a retaliation's threat is more credible if the instruments used in order to realize it are available to those who have a stronger willpower, as it happened with the “nuclear sharing” proposals: the protection of the so called “atomic umbrella” was extended to the allied and this brought the deployment, for defense purposes, also in those nations who didn't want to equip themselves with nuclear weapons. The efficacy of a threat depends on the available options of the potential enemy who must have the possibility for an appeal; the threat of a total retaliation gives the enemy an opportunity to violate regulations <sup>142</sup>.

The concept of deterrence, as it was underlined by Jessie Bernard, it's one of the main ideas which works as a “bridge” between game theory and international relations: the deterrent threat works in fact only on the basis of what a player believes the others do. At the same time players can make a threat because they think this will influence other's choices. In international affairs, deterrence is important both between friends and potential enemies; it can be used indeed in situation of pure and complete antagonism or pure and complete interest's sharing. However Schelling carefully underlines that speaking about “common interests” means that the two considered parts are in the same situation and this happens when one of them believes that it is advantageous to conciliate all the interests in order not to create an irreconcilable conflict: for this reason the author speaks about “potential common interest”.

Compellence, in contrast, usually involves initiating an action (or an irrevocable commitment to action) that can cease, or become harmless, only if the opponents respond. The overt act, the first step, is up to the side that makes the compellent threat. To deter, one digs in, or lays a minefield, and waits, in the interest of inaction. To

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<sup>142</sup> Schelling T. C. (1980), *The Strategy of Conflict*. Harvard University Press, pp. 6-13.



compel, one gets up enough momentum (figuratively but sometimes literally) to make the other act to avoid collision. President Kennedy's sending of the fleet to sea, in quarantine of Cuba in October 1962 can be considered as an historical example of compellence. Although the blockade had some quality of deterrent stage setting, it was essentially an overt act (with a degree of irrevocability in commitment) that forced the Russians to act to avoid a US-USSR collision. The success of the blockade, however, is due probably more to its deterrent-like qualities than those qualities of compellence <sup>143</sup>.

Crisis period represents the second phase of the cold war diplomacy and it has been defined as a brief but strong period in which, in an even more increasing way, the states perceived the possibility that the war would have suddenly burst. Cuban missile crisis is the most significant example of a nuclear crisis: the disaster was felt in such a close way that politics and international relations studios tried to learn from this experience an useful thought in order to be up against incidental crisis. For this reason several guidelines of the so called "crisis management" were created: the main purpose was to find a balance between coercion and agreement, the famous "carrot and stick approach" which had the double purpose to prevail on the enemy and avoid a nuclear war. The term "crisis diplomacy" was exactly used to specify the thorny process of communication and negotiations during these circumstances. From this point of view the most important result of Cuban crisis was the decision to create the so called "hot line" which was a communicating direct line between Washington and Moscow in order to maximize the possibility of direct negotiations between the two super-states.

My case study is part of the compellence or coercive diplomacy phase, the strategic doctrine used by USA between 1945 and 1962. This concept was perfectly analyzed by Thomas Schelling as a sub-species of the theory of deterrence in his work, "The Strategy of Conflict", written in 1961. According to him, using the assumptions of the rationality theory, Kennedy's management of Cuban crisis let the American leadership to control the risks of a nuclear war escalation in order to compel Soviet leaders to dismantle ballistic missiles. The compellent action in the Cuban Missile Crisis was remarkably effective given all the complexities associated with this type of strategy. The U. S. not only forced the Soviet steamship (carrying missiles) to turn around but also got the Soviet to remove the missiles from Cuba. This compellent action made the

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<sup>143</sup> Arms and Influence by T. Schelling Introduction Diplomacy of Violence

verbal threat about removing the missiles credible. Another achievement of this compelling strategy was assuring the Russians if they did remove the missiles the U. S. would not then invade Cuba—an assurance not easily made credible given the Bay of Pigs. The timing of the blockade was near perfect because it caught the Soviet ships on route but with sufficient time to turn around. Consequently, it allowed the U. S. to get some conspicuous compliance on the part of the Soviet Union, if only to make clear to the Russians themselves that there were risks in testing how much the U. S. would absorb. Compellence makes in fact nuclear weapons as powerful instruments of politic influence, used to force others to do what they wouldn't do without threaten. For this reason the compellence avoids the use of brutal power, which is more dangerous and less efficient; however it uses “high risks strategies” as that of brinkmanship. In the specific case US administration compelled the Soviets to dismantle the missile base from Cuba in order to avoid what Herman Kahn has defined as a “vertical escalation”, which means to elevate a conflict at a more destructive violence level. The strategy of compellence, followed by Eisenhower, was elaborated by the State Secretary John Foster Dulles in 1953, as massive retaliation through which he was going to dread the use of nuclear weapons in order to “contain communism” and URSS expansionism that in 1949 had smashed US atomic monopoly.

Between 1950 and 1960's the so called MAD doctrine emerged. “Mutually assured destruction” (M.A.D.) is a doctrine of military strategy and national security policy in which a full-scale use of nuclear weapons by two opposing sides would effectively result in the destruction of both the attacker and the defender, becoming thus a war that has no victory nor any armistice but only total destruction<sup>144</sup>. It is based on the theory of deterrence according to which the deployment of strong weapons is essential to threaten the enemy in order to prevent the use of the same weapons. The strategy is effectively a form of Nash equilibrium in which neither side, once armed, has any incentive to disarm. MAD was unique at the time: never before had two warring nations held the potential to erase humanity with the entry of a few computer codes and the turn of matching keys. Ironically, it was this powerful potential that guaranteed the world's safety: Nuclear capability was a deterrent against nuclear war. Because the U.S. and the USSR both had enough nuclear missiles to clear each other from the map, neither side

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<sup>144</sup> Col. Alan J. Parrington, USAF, Mutually Assured Destruction Revisited, Strategic Doctrine in Question, Airpower Journal, Winter 1997.

could strike first: a first strike guaranteed in fact a retaliatory counterstrike from the other side. Launching an attack would have been tantamount to suicide: the first striking nation could have certainly been that its people would be annihilated, too. For this reason Wohlstetter, RAND Corporation strategists, suggested that the relative advantage was not relevant in the offensive phase: it was important to preserve the second strike capability by making nuclear installations invulnerable to a first strike.

A similar perspective on nuclear deterrence was that of Thomas Schelling, an economist associated with RAND, who eloquently affirmed: “There is a difference between a balance of terror in which either side has the capacity to obliterate the other, and one in which both sides have the capacity no matter who strikes first. It is not the ‘balance’ – the sheer equality or symmetry in the situation – that constitutes ‘mutual deterrence’; it is the stability of the balance”<sup>145</sup>.

The doctrine of MAD guided both sides toward deterrence of nuclear war. It could never be allowed to break out between the two nations. And it virtually guaranteed no conventional war would, either. Eventually, conventional tactics, like non-nuclear missiles, tanks and troops would run out, and the inevitable conclusion of a nuclear strike would be reached. Since that end was deemed unacceptable by the Soviets and Americans, there was no chance of an engagement that could lead to this conclusion. The first ones who understood that the atomic bomb would have been used on large scale were Otto Frisch and Rudolf Peierls, two refugee physicists from Europe working in Birmingham who wrote their revolutionary memorandum on the construction and implications of an atom bomb in the spring of 1940. They pointed out that such a weapon, if exploded on a city, would kill large numbers of civilians and give rise to widespread radioactive contamination. They said in fact: “The most effective reply would be a counter-threat with a similar bomb. Therefore, it seems to us important [they wrote] to start production as soon as possible, even if it is not intended to use the bomb as a means of attack”<sup>146</sup>.

Frisch and Peierls had understood that all the atomic device’s effects would have been devastating, especially in a period in which war directly hit citizens: using atomic

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<sup>145</sup> Thomas Schelling, ‘Surprise Attack and Disarmament’, *RAND P-1574* (1958), quoted in Robert Ayson, *Thomas Schelling and the Nuclear Age* (London: Frank Cass, 2004), p. 60.

<sup>146</sup> Lorna Arnold, ‘The History of Nuclear Weapons: The Frisch–Peierls Memorandum on the Possible Construction of Atomic Bombs of February 1940’, *Cold War History*, 2003, pp. 111-26.

weapon would have involved the destruction of entire populations. However, of all the intellectuals which worked at “Manhattan Project”, only Bohr agreed with Frisch and Peierls’s point of view. After his first visit to Los Alamos at the end of 1943, Bohr was convinced that traditional international diplomacy would not be adequate to address the unfolding nuclear problem, and thought a new level of mutual confidence between nations needed to be forged because, in his eyes, the bomb could become a threat to the security of all mankind. He tried unsuccessfully to convince the top British and American statesmen to prepare for a secure post-war world by informing the Soviets about the atomic bomb before there could be any question of using it<sup>147</sup>. We can say that Born had already a propensity for a deterrence solution. On the contrary, at the beginning, the American administration’s idea was that of absolute winning: this idea was confirmed in Truman Doctrine of 1947. Truman cryptically mentioned the existence of an atomic weapon to Stalin at the Potsdam Conference in July 1945: Truman’s overriding goal was to bring about the immediate end to the war in the Pacific against a cruel, fanatical enemy with the minimum loss of American lives.

But MAD didn’t exactly create an atmosphere in which Soviet premiers and American presidents felt like they could shake hands and call the whole thing off. The nations had very little trust in each other : each side was steadily building its nuclear arsenal to remain an equal party in the MAD doctrine. A détente, or uneasy truce, developed between the U.S. and USSR. They were like two gunslinger foes, adrift alone in a life boat, each armed and unwilling to sleep<sup>148</sup>.

### **3.4 . How can Cuban crisis be explained using the Game Theory?**

The aim of my thesis is that to apply game theory to Cuban missile crisis in order to explain the balance which was kept during that fragile situation: in particular way a certain isomorphism has been marked with the “Chicken Game”, since it is the classical game used to model conflicts in which players are on a collision course. Steven J. Brams has noticed in his “Superpower Games: Applying Game Theory to Superpower

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<sup>147</sup> Finn Aaserud, ‘The Scientist and the Statesmen: Niels Bohr’s Political Crusade during World War II’, *Historical Studies in Physical and Biological Sciences*, 30(1), 1999, pp. 1–48.

<sup>148</sup> Clark, Josh. "What’s Mutual Assured Destruction?" 03 June 2008. <<http://people.howstuffworks.com/mutual-assured-destruction.htm>>

Conflict”<sup>149</sup> that the Chicken analogy can be used as a perfect model to explain what’s happen in October 1962, starting from the assumption that all actions were taken by each side simultaneously and at the end there wasn’t way to verify the values or preference rankings of the players as being consistent with the game of Chicken. According to other games’ theorists studios, there is another model which can be used to explain the Cuban missile crisis: this is the “theory of moves”. It derives from the game theory but changes the rules of the game since author can make past predictions about the leaders' choices, but especially the theory explicates the dynamics of play, based on the assumption that players think not just about the immediate consequences of their actions but their repercussions for future play as well.

Theodore Sorensen, special counsel to President John Kennedy, used the language of "moves" to describe the deliberations of ExCom, the Executive Committee of key advisors to Kennedy during the Cuban missile crisis: "We discussed what the Soviet reaction would be to any possible move by the United States, what our reaction with them would have to be to that Soviet action, and so on, trying to follow each of those roads to their ultimate conclusion"<sup>150</sup>.

After discovering Soviet missiles on Cuban territory, United States wanted immediately to remove those missiles: U.S. policy makers seriously considered different strategies to achieve this end. I’ve focused my attention on four different strategies that I’m going to analyze and, at the end, I will deeply examine the case of “Blockade”.

1. *Take no action*: as underlined by May and Zelikow, from the moment in which the President Kennedy became aware of missiles’presence in Cuba, he and his administration hardly took in consideration the idea of accepting the Soviet’s provocative move. This thought is perfectly summarized in Kennedy’s broadcast to the nation: “...[T]his secret, swift, and extraordinary build-up of Communist missiles in an area well known to have a special and historical relationship to the United States and the nations of the Western Hemisphere, in violation of Soviet assurances, and in defiance of American and hemispheric policy- this sudden, clandestine decision to station strategic weapons for the first time outside of

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<sup>149</sup> Brams, Steven J. (1985). *Superpower Games: Applying Game Theory to Superpower Conflict*. New Haven, CT: Yale University Press.

<sup>150</sup> Sorensen, Theodore C. (1965). *Kennedy*. Old Saybrook, CT: Konecky & Konecky.

Soviet soil- is a deliberately provocative and unjustified change in the status quo which cannot be accepted by the country if our courage and our commitments are ever to be trusted again by either friend or foe”<sup>151</sup>.

In his speech the President alluded to one of the most important element which were and are still part of the US’ identity: the Monroe Doctrine, according to which the outside world should not interfere in the Western Hemisphere and, particularly, in the entire American continent. National Security Advisor, McGeorge Bundy, considered the Monroe Doctrine as a “powerful fact for our political consciousness and the way we perceive our national interest”<sup>152</sup>. However the option of doing nothing was quickly rejected because it was clearly against the flow respect United States culture: leaving Soviet’s missiles on Cuban territory would have affected US dominance in that region and this would have meant an affront to the tradition of the Monroe Doctrine.

2. *Diplomatic approach*: this alternative was evaluated by few people of Kennedy’s administration. Both the President and Adlai Stevenson, U.S. ambassador to United Nations, wanted to settle the conflict in the most peaceful way possible, taking in consideration a policy of “patience and restraint, as befits a peaceful and powerful nation, which leads a worldwide alliance”<sup>153</sup>. The President had to decide between diplomacy and force “...Our quarantine itself isn’t going to remove the weapons so we have only two ways of removing the weapons. One is to negotiate them out, or we trade them out. And the other is to go over and just take them out”<sup>154</sup>. Kennedy’s team discussed the option of sending an emissary to request a immediate cessation of work on the missiles, opening diplomatic channels. This was the only way which would have precluded the USA from acting militarily but at the same time they were running the risk that, while talking in order to reach a compromise, the missiles would have become operational. This wasn’t exactly the idea of the Under Secretary of State, George Ball, according to hum the diplomatic approach “it’s the kind of conduct that one

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<sup>151</sup> May, Ernest and Zelikow, Philip D. (1997). *The Kennedy Tapes: Inside the White House During the Cuban Missile Crisis*. Cambridge, MA: The Belknap Press, pp. 278.

<sup>152</sup> Blight, James G. and Welch, David A. (1990). *On the Brink: Americans and Soviets Reexamine the Cuban Missile Crisis*. New York, NY: The Noonday Press.

<sup>153</sup> May, Ernest and Zelikow, Philip D. (1997). *The Kennedy Tapes: Inside the White House During the Cuban Missile Crisis*. Cambridge, MA: The Belknap Press, pp. 278.

<sup>154</sup> *Ibidem*, p. 464.

might expect of the Soviet Union. It is not conduct that one expects of the United States”<sup>155</sup>. An early warning would have in fact reduced a “surprise effect” and would have given the Soviets a possibility to hide missiles and manipulate world opinion in their favor.

At the same time, the idea of approaching Fidel Castro was floated too: the intention was that to convince Castro, through a diplomatic intermediary, that Cuba was being used as Khrushchev’s pawns to gain ground in Berlin<sup>156</sup>. The chance that Castro would have broken his relations with Moscow was estimated, by Kennedy’s advisor, of being “one chance in a hundred”. I want to report a letter that Castro sent to Khrushchev on the. According to me, it is really interesting to report the letter that Fidel Castro wrote to Nikita Khrushchev on the 26th of October 1962:

“ Dear Comrade Khrushchev:

From an analysis of the situation and the reports in our possession, I consider that the aggression is almost imminent within the next 24 or 72 hours. There are two possible variants: the first and likeliest one in an air attack against certain largest with the limited objective of destroying them; the second, less probable although possible, is invasion. I understand that this variant would call for a large number of forces and it is, in addition, the most repulsive form of aggression, which might inhibit them. [...] I believe that the imperialists’ aggressiveness is extremely dangerous and if they actually carry out the brutal act of invading Cuba in violation of international law and morality, that would be the moment to eliminate such danger forever through an act of clear legitimate defense.[...] It has influenced my opinion to see how this aggressive policy is developing, how the imperialists, disregarding world public opinion and ignoring principles and the law, are blockading the seas, violating our airspace and preparing an invasion...You have been and continue to be a tireless defender of peace and I realize how bitter these hours must be, when the outcome of your superhuman efforts is so seriously threatened. [...] Once more I convey to you the infinite gratitude and recognition of our people to the Soviet people who have been so

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<sup>155</sup> Ibidem, p. 143.

<sup>156</sup> Sorensen, Theodore C. (1965). Kennedy. Old Saybrook, CT: Konecky & Konecky, p. 682.

generous and fraternal with us, as well as our profound gratitude and admiration for you, and wish you success in the huge task and serious responsibilities ahead of you”<sup>157</sup>.

- 3 *Naval blockade*, or "quarantine" as it was euphemistically called, was a decision that evolved over the course of group's discussions. It was a sort of "intermediate option" since it wasn't a surprise attack and neither an impotent diplomatic instrument: its aim was to prevent shipment of more missiles, possibly followed by stronger action to induce the Soviet Union to withdraw the missiles already installed. However, according to the Joint Chiefs and to the Secretary of Defense, Robert McNamara, a blockade didn't assure a military success, was the slowest method for missiles removal and would have led to a declaration of war. Also after the consensus given to this option, there was a strong debate about the consequences: a blockade as an ultimatum followed by powerful actions, such as a strike, if the Soviets didn't respond favorably; a blockade to freeze Soviet action; a blockade as a negotiations' channel<sup>158</sup>.

The reason of why USA chose the so called "quarantine, has been explained, using different arguments, by Theodore Sorensen in his book "Kennedy" and also by Graham Allison in "Essence of Decision". Explaining the Cuban Missile Crisis". Sorensen focuses on the "moral" character of US decision: it was a "limited- low-key action" compared to an air stroke and it was the only military solution that didn't require the killing of Cubans or Soviets. During a meeting at the Congress, Secretary Dean Rusk considered the blockade as a "first step" for a brief pause and let the Soviet Union to contemplate the stakes: it allowed Khrushchev to back down without humiliating him and forcing his hands<sup>159</sup>. At the same time, this was a strong message sent to the Kremlin that there would have been several opened options available to the USA. According to one of the ExComm members, Paul Nitze, it was the result that really counted, using the minimum force necessary: "You didn't want to have violence for violence's sake, you wanted to get the result

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<sup>157</sup> <http://www.pbs.org/wgbh/americanexperience/features/primary-resources/jfk-attack/>

<sup>158</sup> May, Ernest R. and Zelikow, Philip D. (1997). *The Kennedy Tapes: Inside the White House During the Cuban Missile Crisis*. Cambridge, MA: The Belknap Press, p. 191.

<sup>159</sup> Sorensen, Theodore C. (1965). *Kennedy*. Old Saybrook, CT: Konecky & Konecky, p. 688.



and the result was to get rid of these damn missiles”<sup>160</sup>. But, without any doubts, the most important and fundamental thing was that the blockade avoid a nuclear confrontation, which would have meant a global catastrophe. Both Kennedy and Khrushchev wanted to prevent the situation from spiraling out of control and wanted to avoid crisis: “If an option was available to avoid a rapid build to war, Kennedy wanted to take it”<sup>161</sup>.

The explanation given by Allison was completely different, since his theory is articulated in three models: rational, organizational and bureaucratic<sup>162</sup>. However, in his work he underlined the rational character of the Blockade choice: the main reason is that the organizational set-up tends to hold up to each change; the current procedures define the course of actions and lead the states to behave in a way which is contrarious to the instrumental rationality. The deployment of Soviets’ missiles in Cuba clearly shows that the existing organizational procedures didn’t represent the entire spectrum of all the possible options available for both US and Soviet decision makers: the Soviet Union had never allocated nuclear missiles outside its borderline until that moment and there was no procedure to do that. At short notice, different branches of Soviet military apparatus had organized a massive transfer of operating missiles in Central Europe and, on the other side, all the possible replies to Soviet deployment passively depended on the existing organizational procedures: some options, for example, could have also been organized at the moment and immediately put into practice. Also the entire range of military operations wasn’t strictly delimited by organizational procedures: some programs were extremely flexible regarding both the kind of mission and its purposes and other options could have been developed in a certain period of time<sup>163</sup>. However, as Snyder and Diesing have noticed, during the Cuban missile crisis, national leaders from both sides have repeatedly and efficaciously modified their procedures every time it was considered

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<sup>160</sup> Blight, James G. and Welch, David A. (1990). *On the Brink: Americans and Soviets Reexamine the Cuban Missile Crisis*. New York, NY: The Noonday Press, p. 145.

<sup>161</sup> Kennedy, Robert F. (1971). *Thirteen Days: A Memoir of the Cuban Missile Crisis*. New York, NY: W.W. Norton & Co, pp. 42-43.

<sup>162</sup> G.T. Allison (1971), *Essence of Decision. Explaining the Cuban Missile Crisis*. Boston, Little, Brown. This book retakes an argument of an article which was previously published by the author: *Conceptual Models and the Cuban Missile Crisis*, <<American Political Science Review>>, 1969 n.3, pp. 689-718.

<sup>163</sup> An example could be the “Operative Plan 12-62” by the Admiral R.L. Dennison, CINCLANT Historical Account of Cuban Crisis- 1963 (U), Washington D.C., National Security Archive, Cuban Missile Crisis File, p. 17.

necessary: all the activities of US ExComm made the ordinary bureaucratic channels go berserk<sup>164</sup>. Considering Allison's assumption according to which organizational procedures undervalue human rationality, this is true when they limit decision-makers' access to a huge range of information. "The President became aware of missiles' presence on Cuban territories only on the 14th of October rather than three weeks earlier (or one week later) because of the US secret services ordinary practice. Government's ears and eyes don't work as integral part of a unitary head with its own preconceptions and theories, but as organs which carry out their functions in an ordinary way"<sup>165</sup>.

Moreover, during the crisis, some of the major dangers towards a more pacific solution, derived from a breakage of the procedures and not from their normal functioning. Allison considers three examples. Firstly, when Kennedy ordered SAC (Strategic Air Command) to be put on an advanced alert's level, Thomas Power, Sac head-master, gave orders in an ordinary form, without turning to the secret code, as it was forecasted. Then, on the 27th of October, when the crisis had reached its top, the Soviet anti-aircraft in Cuba shot down an American U-2 spy plane without high-ranking generals authorization. Finally, always on the 27th of October, an American U-2 plane broke the order to keep itself away from Soviet territories, lost its route in Siberian air-space and went to emphasize Khrushchev's fear of a nuclear attack<sup>166</sup>. According to both Allison and Krasner, also the bureaucratic model is not able to explain why Kennedy chose the naval blockade: decision-makers don't take a stand that always reflects their bureaucratic position neither they always have a specific position. At the end of his work, Allison sustains that Kennedy and Khrushchev's behaviors reflected their rationality but at the same time their sensibility towards the enormous responsibility that they shared in order to solve the crisis as peaceful as possible. "This nuclear crisis seems to have amplified both the two leaders' comprehension about all the consequences of a nuclear war and the awareness of their responsibilities"<sup>167</sup>. They felt in fact responsible not only towards their own and national interests and their politics

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<sup>164</sup> S.D. Krasner, Are Bureaucracies Important (Or Allison Wonderland)? *Foreign Policy*, No. 7 (Summer, 1972), pp. 171.

<sup>165</sup> Allison *Essence of Decision*, cit., p. 118.

<sup>166</sup> Blight and Welch, *On the Brink*, pp. 338-340.

<sup>167</sup> Allison, *Essence of Decision*, Cit., p. 212.

destinies , but especially towards the entire humanity.

4. "*Surgical*" air strike was, at first, the most favored option by the majority of Kennedy's advisors. Although this idea appealed to many, including the same President, because it was considered effective, quick and clean, then it became apparent that this option was illusory, so that General Maxwell Taylor told Kennedy: "Mr. President, I should say that the Chiefs and the commanders feel so strongly about the dangers inherent in the limited strike that they would prefer taking no military action rather than to take that limited strike"<sup>168</sup>. Moreover, according to Taylor, only an invasion would have ensured the removal of all the missiles, also because if the administration had not acted quickly, the missiles would have become operational <sup>169</sup>. Even if Kenney announced the blockade, the air strike option was still available: if the Soviet Union had chosen to ignore the blockade, the President would have ordered an air strike. The main thing was that all the American operations had to maintain a sort of "surprise effect": an air strike with advance warning was really dangerous because the Soviets would have hidden the arsenal.

Let's consider now the two most licensed American options : the naval blockade and the surgical air strike. The alternative choices open to Soviet policy makers were:

1. **Withdrawal (W)** of their missiles: Soviets have to remove weapons from Cuba;
2. **Maintenance (M)** of their missiles: Soviets leave missiles there.

How can this situation be described using game theory's strategic form? As Brams outlined, it is possible to consider the model of the game of Chicken, as following <sup>170</sup>.

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<sup>168</sup> May, Ernest R. and Zelikow, Philip D. (1997). *The Kennedy Tapes: Inside the White House During the Cuban Missile Crisis*. Cambridge, MA: The Belknap Press, p. 96.

<sup>169</sup> Sorensen, Theodore C. (1965). *Kennedy*. Old Saybrook, CT: Konecky & Konecky, p. 682.

<sup>170</sup> Brams, Steven J. (1985). *Superpower Games: Applying Game Theory to Superpower Conflict*. New Haven, CT: Yale University Press.

SOVIET UNION

	WITHDRAWAL (W)	MAINTENANCE (M)
BLOCKADE (B)	(3,3) Compromise	(2,4) Soviet victory, US defeat
AIR STRIKE (A)	(4,2) US victory, Soviet defeat	(1,1) Nuclear war

UNITED STATES

**Figure 1: Cuban missile crisis as Chicken**

Key: (x, y) = (payoff to U.S., payoff to S.U.)

4=best; 3=next best; 2=next worst; 1=worst

The best strategy for each player would be (4,2) for USA and (2,4) for the Soviet Union. However, each player risks that the other will also choose his best strategy and it means that the result will be (1,1), the nuclear war. Since each player's choice depends on the other's choice, it gives each the incentive to threaten non to cooperate, hoping that the other will yield so that the given player will have the best outcome. It is important to say that these strategic choices, probable outcomes and relative payoffs reveals only a side of the crisis since, both sides considered more than the listed alternatives. The Soviets, for example, demanded withdrawal of American missiles from Turkey as a *quid pro quo* for withdrawal of their own missiles from Cuba, a demand publicly ignored by the United States. Although in one sense the United States "won" by getting the Soviets to withdraw their missiles, Premier Nikita Khrushchev of the Soviet Union at the same time extracted from President Kennedy a promise not to invade Cuba, which seems to indicate that the eventual outcome was a compromise of sorts. This can't be considered game theory's prediction for Chicken, because the strategies associated with compromise do not constitute a Nash equilibrium.

Using Chicken to model a situation such as the Cuban missile crisis is problematic because, in real life, the two sides did not choose their strategies simultaneously, or

independently of each other, as assumed in the game of Chicken described above. The Soviets responded specifically to the blockade after it was imposed by the United States. Moreover, the fact that the United States held out the possibility of escalating the conflict to at least an air strike indicates that the initial blockade decision was not considered final - that is, the United States considered its strategy choices still open after imposing the blockade.

There are good reasons to believe that U.S. policymakers did not view the confrontation to be Chicken-like, at least as far as they interpreted and ranked the possible outcomes. We can consider another "payoff" model that considers a set of preference rankings based on comments of Kennedy's administration and Khrushchev. The possible options were four:

**BW:** The choice of blockade by the United States and withdrawal by the Soviet Union remains the compromise for both players - (3,3).

**BM:** In the face of a U.S. blockade, Soviet maintenance of their missiles leads to a Soviet victory (its best outcome) and U.S. capitulation (its worst outcome) - (1,4).

**AM:** An air strike that destroys the missiles that the Soviets were maintaining is an "honorable" U.S. action (its best outcome) and thwarts the Soviets (their worst outcome) - (4,1).

**AW:** An air strike that destroys the missiles that the Soviets were withdrawing is a "dishonorable" U.S. action (its next-worst outcome) and thwarts the Soviets (their next-worst outcome) - (2,2).

SOVIET UNION

	WITHDRAWAL (W)	MAINTENANCE (M)
BLOCKADE (B)	(3,3) Compromise	(1,4) Soviet victory US capitulation
AIR STRIKE (A)	(2,2) “Dishonorable” US action, Soviets thwarted	(4,1) “Honorable” U.S action, Soviets thwarted

Figure 2. Key: (x,y) = (rank of the US, rank of SU),  
4= best; 3= next best; 2=next worst; 1= worst

In this case the compromise option remains the same: (BW 3,3); the next outcome (BM) is a scenario where the U.S would impose a blockade and be ignored by Soviets that will reach their best outcome (1,4) which is the worst for the US. Next, (AM), a US air strike would destroy the missiles and thwart the Soviets: this situation is (4;1) which is the Soviet’s worst outcome and the US best one. Finally, (AW), an air strike would destroy missiles that the Soviets were withdrawing, a “dishonorable” action on the part of the US which thwarts the Soviets. Also this model assumes the choices were made simultaneously. In responding to a letter from Khrushchev, Kennedy said:

"If you would agree to remove these weapons systems from Cuba . . . we, on our part, would agree, first of all to remove promptly the quarantine measures now in effect and secondly to give assurances against an invasion of Cuba”<sup>171</sup>.

These words are consistent with this second games representation since (3,3) is preferred to (2,2) by the United States, whereas (4,2) is not preferred to (3,3) in Chicken. If the Soviets maintained their missiles, the United States preferred an air strike to the blockade. As Robert Kennedy, a close adviser to his brother during the crisis, said:

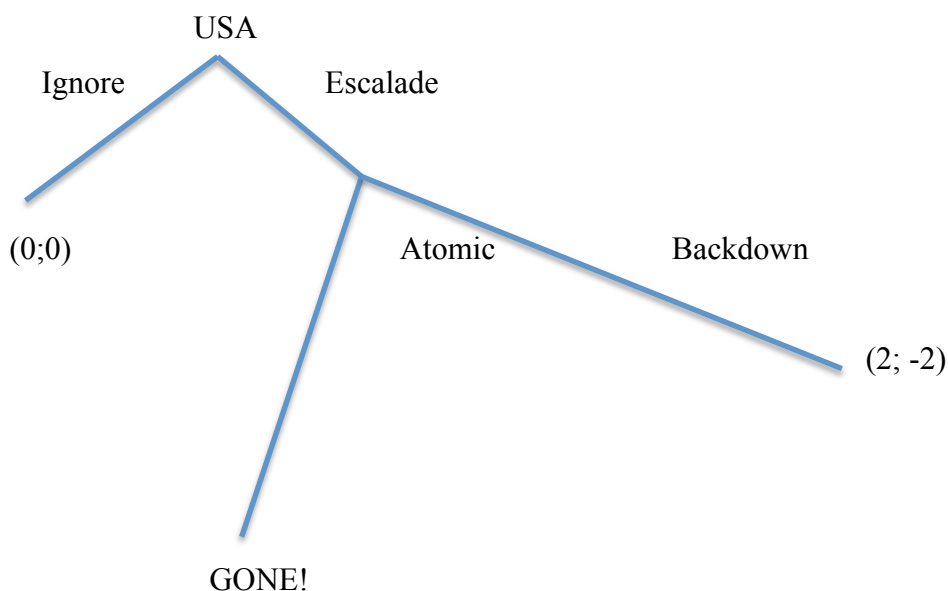
<sup>171</sup> <http://microsites.jfklibrary.org/cmc/oct26/doc6.html>  
Telegram of President Kennedy's Reply to Chairman Khrushchev's Letter of October 26, 1962  
Washington, October 27, 1962, 8:05 p.m.

"If they did not remove those bases, we would remove them", which is consistent with Alternative, since the United States prefers (4,1) to (1,4) but not (1,1) to (2,4) in Chicken.

It is well known that several of President Kennedy's advisers felt very reluctant about initiating an attack against Cuba without exhausting less belligerent courses of action that might bring about the removal of the missiles with less risk and greater sensitivity to American ideals and values. Pointedly, Robert Kennedy claimed that an immediate attack would be looked upon as "a Pearl Harbor in reverse, and it would blacken the name of the United States in the pages of history," which is again consistent with the alternative game model since the United States ranks AW next worst (2) - a "dishonorable" U.S. action - rather than best (4) - a U.S. victory - in Chicken.

We can now consider two game's description, by using the Extensive form, which propose the perfect Nash Equilibrium.

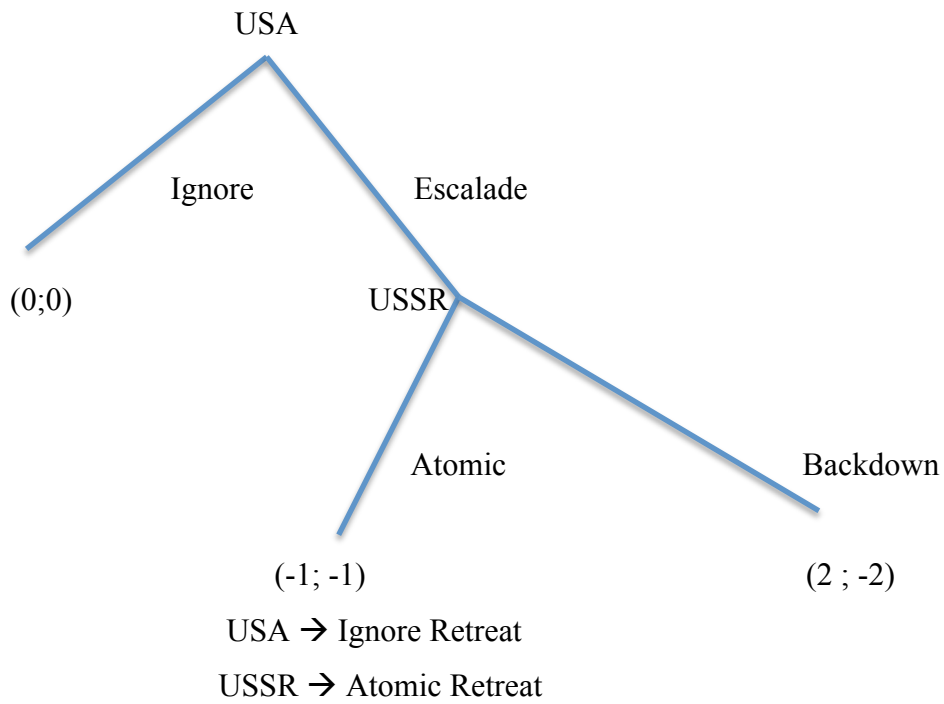
#### SUBGAME PERFECT NASH EQUILIBRIUM



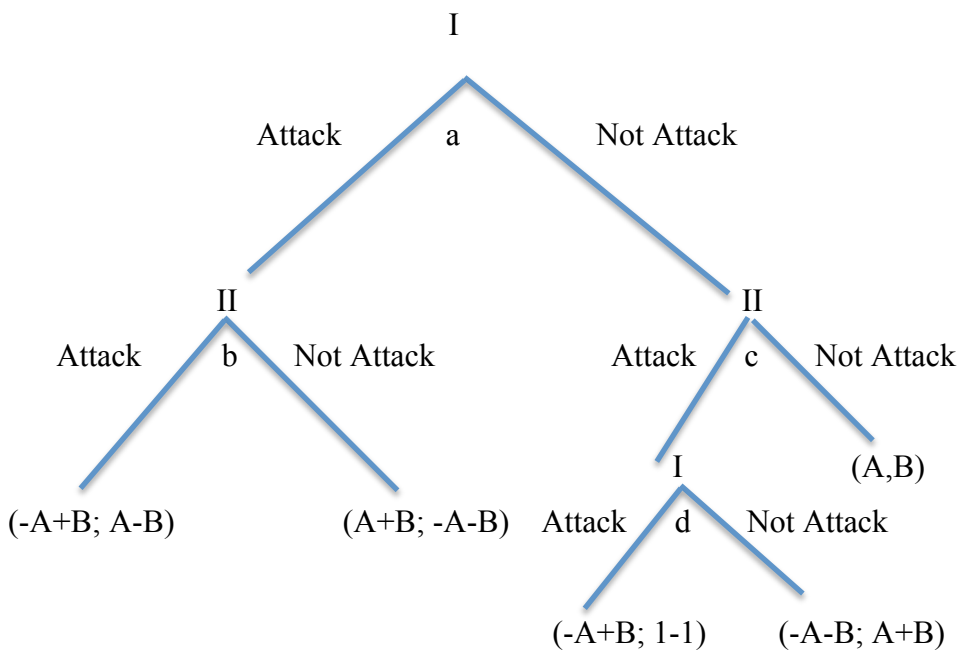
US → Escalate Nuke

URSS → Backdown Nuke

SUBGAME PERFECT NASH EQUILIBRIUM



Finally it is possible to describe, in an extensive form, also the so called MAD equilibrium.





In this model we can notice that there are two players (I, II) which are USA and USSR: if the first decides not to attack, then the second will take the same decision. Our purpose is not to show if there is an advantage for the player who moves first (there is no advantage), but to demonstrate that the balance is that according to which no player is interested in attacking the other. A and B are the two payoffs (they have the same value) and they refer to the state's survival; however the possibility of destroy the enemy is considered as a gain for each player. For example if I destroys II, the first one gains B and, at the same time, if II destroys I, II gains B. We can now consider all the possible course of actions. If player I chooses to attack, player II will have to choose whether attack or not: if player II decides not to attack, he would lose his life, causing damage such as  $-A$  losing all possibilities to destroy his enemy (he will gain  $+B$ ). In this case, the payoff of the player II will be  $(-A-B)$ ; indeed, player I saves his life and destroys his enemy, so that the payoff of player I will be  $(A+B)$ .

On the contrary, if player II decides to attack, he will lose his life but he will also make player I be peaceful: player I would receive  $(-A+B)$ , while player II would obtain  $(A-B)$ . However, we know that in these kinds of interdependence situations, both the players are rational: this means that II will try to maximize his expected utility at his knot's level. Since  $(A-B) > (-A-B)$ , player II will certainly decide to counterattack. The logical consequence is that player I, aware of the other player's rationality, will not decide to attack first because he knows that, in this way, he will receive  $(-A+B)$ . Let's now see what would happen if player I didn't attack: player II would be in the same situation as player I and has now to decide if he should attack or not. If he didn't attack, the game would begin again.

In conclusion we can assert that MAD equilibrium had guaranteed a stable situation for all the duration of the international bipolar asset. However, one of the two players got out from the game: the implosion of Soviet system, after the fall of Berlin's wall on the 9<sup>th</sup> of November 1989, ended the mutual deterrence, according to which no attack would have been unpunished. The final capitulation of Moscow, already oppressed by what has been defined as "the horrors of Communism", has certainly been speeded up by Ronald Reagan's idea of the so called "star wars", which was the keystone of SDI (Strategic Defense Initiative) doctrine. Such an powerful defense would have

neutralized Soviet capability of reply to an American attack or, at the same time, would have immunized USA if USSR had attacked first. Although it was really difficult to realize it, Reaganian idea of the “space race” was fundamental in order to keep the Russian enemy be quiet and it had a remarkable media importance. I think that nowadays it’s almost impossible to face with a situation similar to that of MAD period: there aren’t any nations that are able to compete, from a military point of view, which such a huge armament as that of NATO. Even if some countries would equipped themselves with a considerable arsenal, the deterrence balance would be extremely dangerous since it would be possible to create powerful alliances: nobody would be able to answer in an efficient way to an atomic coalition. This surely represents an advantage for the greatest nations because they can supervise, in an even more heated way, the proliferation of the atomic weapons.

## CONCLUSION

For many years several scholars have spoken about the so called theory of “Hegemonic war”, referring to a particular kind of war which was caused by wide changes in the fields of political, strategic and economic relations among nations. This is a war which threatens and transforms the structure of the international system: in particular way the power hierarchy is put into play. This theory is without any doubt useful in order to explain what happened in the past (it was in fact used to identify the causes of “Peloponnesian war” between Athens and Spartan, those of the War of the “Two Roses” war and finally those of the “First World War”) but, is it also remarkable for the contemporary world? Has this theory been overtaken by the nuclear revolution? Is it still reasonable to speak about hegemonic war if no nation, involved in a nuclear conflict, can avoid its own destruction?

It is impossible to hide that a revolution in the nature of the warlike activity has happened: nuclear weapons have deeply changed the destructive resources and the consequences of a big war. We can lack confidence in the fact that a war between two big powers can be limited and in the fact that it is possible to avoid an escalation or also a total war. In the nuclear era, the first aim of nuclear powers is to dissuade enemies from using nuclear weapons in order to prevent a hegemonic war. However a change in the nature of war, although it has been particularly relevant, does not imply a change in the nature of international relations. The most important characteristic of international affairs hasn't been modified but, on the contrary, it has been intensified: international politics keep being an auto-defense politics. In the anarchical atmosphere of international relations, the lack of trust, the general uncertainty and insecurity have pushed nations to arm themselves and get ready to a hypothetical hegemonic war. There would have been a deep change in the human conscience in order to avoid the burst of such a disastrous war: humankind should have been willing to subordinate its own values and aims to peace maintenance. People should place themselves in the hands of a sort of Leviathan and give up national priorities.

However, it is impossible not to consider the possibility of a really huge war during the nuclear era: the big wars of the past have rarely been forecasted and their development has never been expected. Nuclear weapons progression has brought to the heart of

politics men's discussions and worries, the desire of avoiding a total war. All "nuclear states" are trying to escape from the possibility of the atomic war but, at the same time, they are still defending their national interests: each superpower is afraid that the other can go one step further from a technological point of view so that it would take advantage of its superiority. Furthermore, thanks to armament's proliferation among a high number of states, the risk that those weapons can run into nations in which terrorist groups have the power (the so called "rogue states") is becoming even more perceived. As in the past, if a state suspected that its relative power could diminish, it would easily begin a war: it is not illogical to think about that several states could resort to nuclear blackmail in order to prevent their own adversaries' attack.

Although violence and war destructive capability were modified by the arrival of nuclear weapons, it is difficult to believe that also human nature has been changed. We can only hope that the fear of the so called "nuclear holocaust" would hold back politicians: they should understand that nuclear asset based on mutual deterrence represents their main worry. However the long history of human fragilities and the apparent incapability to maintain a peaceful system for a long period, are counterposed to this expectation.

As Morgenthau affirmed, I think that it is right to think that "the nuclear power has destroyed the rational relations between violence as a means and a goal of foreign policy"<sup>172</sup>.

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<sup>172</sup> H.J. Morgenthau, *Western Values and Total War*, "Commentary", 32, 1961, (October 1961), p. 280.

## WEB SITES

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## SINTESI

La teoria dei giochi applicata alle relazioni internazionali, con particolare riferimento all'ambito della strategia internazionale e della deterrenza atomica, è stata definita da Thomas Schelling, nell'opera "The Strategy of Conflict", come una scienza in ritardo. Come si può spiegare tale definizione?

Quando si parla di strategia, quasi in maniera inconsapevole, si va a limitare il campo di ricerca poiché l'assunto da cui si parte è sempre quello della razionalità degli agenti che agiscono essenzialmente in vista della massimizzazione della loro utilità e dei vantaggi che determinate azioni possono comportare. Le conseguenze di tali comportamenti saranno quindi soltanto una buona approssimazione della realtà ma non ne andranno a dipingere tutti i possibili aspetti esistenti. D'altra parte, il vantaggio che la teoria dei giochi trae dall'occuparsi direttamente dell'area della strategia deriva dal fatto che, tra tutti i plausibili approcci, è di gran lunga quello più vicino alla realtà, proprio in virtù del presupposto di razionalità su cui si basa. La teoria dei giochi concerne infatti la relazione strategica tra due o più individui, o giocatori, e questo permette di analizzare i processi analitici dei rispettivi partecipanti a un "conflitto", di esaminare le linee di condotta dei singoli, le possibili alternative nonché i reali o ipotetici risultati conseguiti ma, soprattutto, è una teoria che parte dalla constatazione che la migliore azione per ogni partecipante dipende esattamente da ciò che egli si aspetta che gli altri partecipanti facciano. Una minaccia deterrente risponde in modo ottimale a questa definizione: funziona solo in base a ciò che un giocatore si aspetta che l'altro faccia in risposta alle sue mosse.

Molti studiosi che si sono cimentati in teorie relative alla deterrenza avevano più che altro come obiettivo primario quello di risolvere problemi immediati e non erano certo mossi dalla motivazione di sviluppare di una struttura teoretica che fungesse da solida base per lo studio di situazioni di interazione strategica. Non è nemmeno facile dire con certezza se studiosi di politica si siano interessati unicamente alla risoluzione di suddetti problemi o alla creazione di una metodologia adeguata e indispensabile per arrivare ad una soluzione. Aldilà dell'aspetto concernente puramente i modelli esplicativi utilizzati, un'altra questione da analizzare sul perché la teoria dei giochi applicata alle relazioni internazionali non sia sempre stata esaustiva riguarda unicamente l'idea per cui gli attori

effettuano scelte simultanee con l'unico obiettivo di raggiungere i massimi risultati attesi. Al contrario, come molti studiosi, tra cui Waltz, ci insegnano, nella realtà sono molteplici i fattori o "processi decisionali", (come lo studioso realista Duroselle li definisce), che spingono ad un determinato comportamento: fattori etici, morali o riferiti al contesto sociale in cui ci si trova ad operare o relativi, infine, semplicemente al buon senso comune. È stata verosimilmente una notevole dose di "buon senso" a guidare il comportamento di Kennedy e Khrushchev durante i tredici ma lunghissimi giorni in cui si sviluppò la crisi missilistica cubana?

L'obiettivo della mia tesi è esattamente quello di spiegare cosa successe durante la crisi dei missili di Cuba dell'ottobre del 1962, uno dei momenti di maggiore tensione nel corso dell'intera guerra fredda, tramite l'applicazione della teoria dei giochi. Mi sono soffermata in particolare sul c.d. equilibrio del MAD (Mutual Assured Destruction) esistente tra gli USA e l'URSS, una sorta di "equilibrio del terrore" che probabilmente fu la chiave di volta che evitò lo scoppio di una guerra nucleare e ho cercato di rappresentarlo tramite un gioco in forma estesa. La tesi è divisa in tre capitoli ciascuno dei quali, a sua volta, in tre o quattro paragrafi.

Il primo capitolo è unicamente dedicato alla teoria della razionalità in quanto base teoretica della teoria dei giochi: uno degli assunti fondamentali da cui parte è proprio il carattere razionale e intelligente dei giocatori che ne sono coinvolti. Mi sono innanzitutto soffermata sulle origini della teoria della razionalità, che possono essere datate al capolavoro di Thomas Hobbes, il Leviatano, in cui l'autore cerca di spiegare il funzionamento delle istituzioni politiche partendo dalle scelte degli individui. Tale teoria ha poi avuto una sua "età dell'oro" con gli utilitaristi, i quali hanno cercato di sottolineare il legame esistente tra le decisioni del singolo e il raggiungimento del benessere sociale. Ho poi analizzato le caratteristiche della "Modern choice rational Theory" messe in luce da Von Neumann, nonché i suoi limiti: spesso gli individui non sono in grado di prendere decisioni in vista dell'utilità attesa ma sono altri i parametri che influenzano le azioni. A tal fine è stato fondamentale prendere in considerazione i concetti delle "euristiche" e dei "biases", studiati da Tversky e Khaneman: si tratta di un approccio cognitivo indicante delle "scorciatoie" che la mente umana effettua per arrivare più rapidamente a cogliere o ricordare un concetto, una situazione, talvolta anche un'emozione. Infine ho considerato anche come questa teoria potrebbe essere

applicata alle situazioni politiche, soffermandomi in particolare sull'opera di Green e Shapiro dal titolo "Pathologies of Rational choice theory: A critique of application in political science", da cui è emerso che la teoria della razionalità viene utilizzata soprattutto in alcuni ambiti delle scienze politiche: cooperazione sociale tra i governi, partiti o schieramenti, ciclo elettorale, guerre o situazioni strategico-difensive.

Il secondo capitolo è interamente incentrato sulla teoria dei giochi, ossia la c.d. "scienza della strategia", il cui obiettivo è quello di determinare in modo logico e matematico le scelte che i giocatori dovrebbero effettuare, in situazioni di interdipendenza strategica, per assicurarsi un esito di "first best". Sebbene sia noto che questa teoria venne sviluppata nel 1928 da John Von Neumann e resa nota solo nel 1944 insieme a Morgenstern nel famoso saggio "Theory of games and economic behavior", è stato interessante scoprire che, in realtà, tracce della teoria dei giochi sono state rinvenute addirittura nel "Talmud" babilonese e nel "Simposio" platonico. Aldilà delle sue origini, ne ho analizzato i concetti fondamentali, primo tra tutti il famoso "equilibrio di Nash", partendo da una scena del film "A Beautiful Mind", relativo alla biografia del premio Nobel, da poco defunto, John Nash. Dopo essermi soffermata un po' più a lungo sul "Dilemma del prigioniero", ho considerato i diversi giochi e le diverse forme in cui la teoria si ramifica.

Il terzo e ultimo capitolo è invece basato sul mio caso di studio: la crisi missilistica di Cuba. Partendo dal famoso discorso di Winston Churchill, "The iron curtain", pronunciato a Fulton il 5 marzo del 1946, mi sono soffermata su una panoramica del contesto storico della guerra fredda che, per quasi cinquant'anni, mantenne il mondo con il fiato sospeso a causa della paura dello scoppio di una terza guerra mondiale. Tra le mie ricerche ho trovato e riportato alcuni articoli interessanti, ma allo stesso tempo ironici, tratti dalla rivista americana "The New Yorker", tra i quali anche uno relativo al famoso film di Stanley Kubrick "Doctor Strangelove", parodia dello stato d'animo dell'opinione pubblica e dell'esercito americano nel periodo della guerra fredda. Ho poi effettuato un excursus di quello che accadde durante i famosi nonché terribili tredici giorni (15-28) dell'ottobre 1962, prendendo in considerazione discorsi e scambi epistolari dei protagonisti, Khrushchev, Kennedy e Fidel Castro, aggiungendo anche un'interessante parte di un memorandum della CIA in cui viene spiegata in maniera dettagliata la collocazione dei missili nella baia cubana. Il terzo paragrafo è invece

dedicato alla diplomazia della guerra fredda, definita da Schelling: “The diplomacy of violence as the art of coercion and intimidation”. Mi sono soffermata sulla fase della compellenza e su quella della deterrenza, quest’ultima rappresentante uno dei concetti fondamentali che funge da “ponte” tra la teoria dei giochi e le relazioni internazionali, nonché sulla definizione del famoso equilibrio del MAD. Ho infine considerato le plausibili decisioni che gli americani avrebbero potuto scegliere, le considerazioni su di esse da parte dei ranghi elevati dell’esercito statunitense e del presidente J.F. Kennedy, i loro pro e i loro contro. Tra le azioni che gli USA avrebbero potuto intraprendere vi erano: l’inazione, il blocco diplomatico, l’attacco aereo e il blocco navale, o “quarantena”, ciò che effettivamente venne scelto dal momento che rappresentava una sorta di opzione mediana tra quella più catastrofica del bombardamento aereo e quella più passiva del non intervento. Ho cercato poi di spiegare, ricorrendo al famoso “Chicken Game”, come le due superpotenze riuscirono a mantenere immutato l’equilibrio del terrore e ad evitare una catastrofe atomica, tramite una rappresentazione in forma estesa che rappresenta la strategia dell’equilibrio del MAD.

La conclusione a cui sono giunta alla fine della stesura della mia tesi è che è assolutamente impossibile nascondere la portata della rivoluzione che ha conosciuto l’arte della guerra: le armi nucleari hanno profondamente cambiato le risorse distruttive e le conseguenze di una grande guerra. C’è poca fiducia nel fatto che una guerra tra due super potenze possa avere una dimensione limitata e che possa essere possibile evitare un’escalation o una guerra totale.

Nell’era del nucleare, il primo scopo dell’arma atomica è infatti quello di dissuadere il nemico ad utilizzare la stessa proprio per prevenire una guerra egemonica. In ogni modo un cambiamento della natura della guerra, per quanto sia stato particolarmente rilevante, non ha implicato, allo stesso tempo, un cambiamento nella natura delle relazioni internazionali. Una delle caratteristiche più importanti degli affari internazionali, non è stata modificata, al contrario è stata intensificata: la politica internazionale continua ad essere una politica di autodifesa. Nell’atmosfera anarchica delle relazioni internazionali, la mancanza di fiducia, la generale incertezza e insicurezza hanno spinto le nazioni ad armarsi e ad essere sempre pronte a rispondere a quella che Aron ha definito “guerra egemonica”. Sarebbe necessario un drastico cambiamento della coscienza umana per evitare lo scoppio di un’eventuale catastrofe: gli uomini dovrebbero subordinare i loro



obiettivi e interessi personali al mantenimento della pace e i governanti nazionali dovrebbero rimettersi nelle mani di una sorta di “Leviatano” e abbandonare le loro priorità. In ogni caso nell’era del nucleare è quasi del tutto impossibile non considerare la possibilità di una guerra di immensa portata: le grandi guerre del passato, del resto, non vennero mai previste.

Paradossalmente, proprio lo sviluppo e il progresso delle armi nucleari hanno fatto scaturire nelle menti degli uomini politici, il desiderio di evitare una guerra totale: gli stati dotati di armamenti atomici stanno cercando da un lato di rifuggire tale possibilità, dall’altro continuano comunque a difendere gli interessi nazionali. Questa contraddizione si basa sul fatto che ogni superpotenza teme che le altre possano fare passi avanti in quanto sviluppo tecnologico e prendere una posizione di vantaggio, il che potrebbe essere una sorta di corollario della “Teoria della distruzione creatrice” di Schumpeter. In più, a causa della proliferazione delle armi nucleari tra un numero sempre più elevato di Stati, si sta percependo sempre più il rischio che queste armi possano finire nelle mani dei c.d. “Stati canaglia”, quei paesi cioè in cui il potere, se non formalmente ma senza dubbio di fatto, è mantenuto da gruppi terroristici.

Ciò che penso è che, nonostante la violenza e la capacità distruttiva della guerra siano state profondamente modificate dallo sviluppo dell’arsenale atomico, è difficile credere che anche la natura umana sia cambiata. Si può solo sperare che la paura di ciò che è stato chiamato “olocausto nucleare” possa spingere gli uomini politici a fare un grande passo indietro: è necessario che costoro comprendano che l’assetto nucleare basato sulla mutua deterrenza, è oggi uno dei principali problemi delle relazioni internazionali. Purtroppo, la lunga e difficile storia delle fragilità umane e l’apparente incapacità di mantenere un assetto pacifico tra le nazioni per un lungo periodo, si oppongono a questa aspettativa.