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**GAME THEORY AND THE APPLICATION TO MAINLAND CHINA-TAIWAN  
RELATIONS FROM 1949-1995**

by

**Po-tung Chang**

**A Thesis  
Submitted to the  
Faculty of The Graduate College  
in partial fulfillment of the  
requirements for the  
Degree of Master of Arts  
Department of Political Science**

**Western Michigan University  
Kalamazoo, Michigan  
December 1996**

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1996

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Po-tung Chang

# GAME THEORY AND THE APPLICATION TO MAINLAND CHINA-TAIWAN RELATIONS FROM 1949-1995

Po-tung Chang, M. A.

Western Michigan University, 1996

This study is dedicated to evaluating the capacity of game-theoretical models in analyzing and explaining international crises like mainland China-Taiwan relations. To highlight and reflect the nature of these complicated long-run relations, the author formulates a dynamic game model based on the combination of three well-known models, Deadlock, Prisoner's Dilemma, and Chicken instead of occupying one dominant model.

The mainland China-Taiwan relations (1949-1995) are divided into three individual phases in accordance with the configuration of game models: (1) the military confrontation phase (1949-78); (2) the peaceful competition phase (1978-86); and (3) the premature cooperation phase (1987-95). By generating and suggesting hypotheses, e.g., Chicken is more suitable than Prisoner's Dilemma in explaining mainland China-Taiwan relations in the post-Cold War era., the author tries to identify the likely patterns of strategy-choosing behavior of mainland China and Taiwan in terms of analyzing how, when, and why both sides adopted and shifted the strategies from one period to another. Also, the author witnesses a couple of limitations for the applications of game models.

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## CHAPTER I

### INTRODUCTION

#### Scope and Purpose

In their influential book, Theory of Games and Economic Behavior, von Neumann and Morenster<sup>1</sup> introduced a new instrument of analysis. They called this instrument “game theory” a way to address complicated social or political issues. Under the leadership and efforts of Schelling, Luce, and Rapoport (up to the 1960s), game theory was developed as a relatively integrated and concise theory in comparison to other types of rational choice theory. Even more social scientists with limited mathematical training became interested in game theory, beginning to study the primary assumptions and characteristics of this theory, applying it to describe the world around us.

Because of the “usefulness of drawing analogies between real world situations and particular games or types of game,”<sup>1</sup> during the past five decades of its existence, political scientists frequently applied game theory to the analysis of international relations or crises such as the Berlin Crisis of 1958-60, the Cuban missile Crisis of 1962, the Cyprus Conflict, and the like. In this thesis, I attempt to attain a two-track purpose.

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<sup>1</sup> Ken Binmore, Essays on the Foundations of Game Theory (Cambridge, Massachusetts: Basil Blackwell, 1990), p. 32.

On the one hand, I will examine the capacity of game theory in generating relevant hypotheses by the applications of game-theoretical models to international conflicts. That is, I expect to see if it can help us understand a strategic situation by means of suggesting hypotheses. In terms of strategy selection and transformation of the players, I hope that it will contribute to our primary understanding of the patterns of interaction between mainland China and Taiwan in the past 40 years.

Typically, the scope of game theory focuses on situations in which an individual is competing with other individuals. This also refers to situations of interest conflict among groups and nations. By means of the review of literature dealing with the applications of game theory, our attention will be drawn to the salient characteristics and uses of game theory. In particular, two-by-two models, as they concisely describe “the basic structure of the crisis<sup>2</sup>,” in which a strategic situation is highlighted.

What is game theory? In order to begin answering this question, we need to examine some basic concepts and assumptions. Overall, game theory is formulated based on two relevant assumptions: (1) the idea of rationality (or rational actors); and (2) expected utility. To simplify understanding of the concept of rationality, describing the rational choice approach which shares assumptions with game theory is necessary. Theorists derive the rational choice approach from a series of assumptions, i.e., utility maximization, patterns of individual preferences, decision making under uncertainty,

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<sup>2</sup> Glenn H. Snyder and Paul Diesing, Conflict Among Nations (Princeton, New Jersey: Princeton University Press, 1977), p. 83.

and the centrality of individuals in the explanation of collective outcomes.<sup>3</sup> Elster contends that a rational-choice explanation or prediction of an action should meet three sets of requirements. First, the action is adopted under the following optimal conditions: (1) the action is the best or the relatively best strategy for the actor to satisfy her/his desire derived from her/his belief; (2) that belief is the best he or she could formulate given the evidence; and (3) how much evidence collected is itself optimal and corresponds with her/his desire. Second, the relationship between desire and belief must be consistent, i.e., free of internal contradictions. The last requirement gives emphasis to a set of causal conditions among the desires, the beliefs, and the actions. That is, the desire and the belief must not only rationalize the action, but results from them “in a right way.”<sup>4</sup> To be sure, based on the assumption, we tend to be rational and expect that others will behave rationally in return. The rational choice approach has been regarded as “one of the dominant paradigms of political and social science, offering insightful, rigorous, and parsimonious expectations.”<sup>5</sup> More literature with respect to the relationship between the rational choice approach and game theory will be discussed in a latter section.

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<sup>3</sup> Donald P. Green and Ian Shapiro, Pathologies of Rational Choice Theory (New Haven, Connecticut: Yale University Press, 1994), p. 13.

<sup>4</sup> Jon Elster, “Introduction,” Rational Choice, Jon Elster, ed. (New York: New York University Press, 1986), p. 16.

<sup>5</sup> Kristen Monroe, “The Theory of Rational Action: What Is It? How Useful Is It for Political Science?” Political Science: Looking to the Future, William Crotty, ed. (Evanston, Illinois: Northwestern University Press, 1991), p. 2.

Like the rational choice approach, game theory is based on the assumption of rationality because it assumes that each player behaves as a rational actor in order to maximize his interests or minimize his losses in a game, i.e., under a conflict situation. In other words, game theory attempts to analyze rational actors who may or may not have common or diverse goals under certain conflict situations. Thus, one may raise the question: Why should we study rational actors? According to Binmore, the answer could be that the rational choice approach (or game theory) not only assumes the rationality of the actors but also their attitudes and treatments to each other “as though they were all rational in the same sense.” One advantage of this viewpoint is that the actors are not viewed as “omniscient mathematical prodigies.”<sup>6</sup> Besides, communication and discussion would be impossible if these activities were not based on the essential assumption of rationality, i.e., each individual believes in the rationality of the others.<sup>7</sup>

Unlike the rational choice approach, game theory is eager to avoid extending its scope into the psychological arena, i.e., it tries not to describe and analyze the transformations or interactions between the players’ desire or belief. Put another way, game theory is not supposed to justify the players’ goals as right or wrong. Through well-formulated models, it aims to explain how the players achieve their goals under

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<sup>6</sup> Ken Binmore, p. 61.

<sup>7</sup> K. Midgaard, “On the Signification of Language and a Richer Concept of Rationality,” Politics as Rational Action, L. Lewin and E. Vedung, eds. (Dordrecht: Reidel, 1980), pp. 83-97.

the situation in which the players have completely conflicting or mutual interests and their actions are interdependent. Of course, game theory is based on the following hypothesis on rationality: the more the players know about the game and the other player, the easier it should be for them to respond to each other's reasoning and to predict each other's actions.<sup>8</sup> Then, we may raise the following questions: Who will win or lose in a game if each player is rational in choosing strategies and actions? Could it be possible that rational actions result in unexpected or irrational outcomes to the players? According to one of the characteristics of game theory, the final results are determined by the mixture of the players' actions and the structure of the game. In other words, a rational action may not guarantee the expected outcome, for example, in the Prisoner's Dilemma, in which both rational actors choose the strategy conducive to their own maxim interest but end up suffering the second worse outcome. How can we solve such a conflict situation like Prisoner's Dilemma, i.e., the conflict between individual and collective rationality? Or, in Axelrod's words, what conditions can foster "the emergency of cooperation"<sup>9</sup>? Arguments and explanations related to the questions we raised will be covered in the literature review.

Schelling notes that what a rational action means is not only intelligent

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<sup>8</sup> Cristina Bicchieri, Rationality and Coordination (New York: Cambridge University Press, 1993), p. x.

<sup>9</sup> Axelrod emphasized on frequent contacts among players and the principle of reciprocity as two key factors conducive to foster cooperation; see Robert M. Axelrod, The Evolution of Cooperation (New York: Basic Books, 1984), pp. 27-55.

behavior, but also behavior “motivated by conscious calculation of advantages, calculation that in turn is based on an explicated and internally consistent value system.”<sup>10</sup> His argument is similar to one of the major assumptions of utility theory: A person can precisely make up his preference ordering among various alternatives and assign quantitative units like money to each alternative. As for another relevant assumption of utility theory, it emphasizes that a person knows well what probability is attached to given alternatives. In fact, they derive the concept of “expected utility” from the combination of the preceding two assumptions of utility theory. That is, a rational actor can calculate his or her expected utility by the following axiom:

$$EU(A) = \sum_{\text{all } S} P(S) U[(S, A)], \text{ he or she will choose the strategy } A \text{ so that } EU(A) \text{ is maximized.}$$

Where EU is expected utility, A is an available action, P is probability, S is a state, U is utility, and C(S, A) represents the consequence that results when S is the state and A the action. Each action is evaluated both for the likelihood of the consequences it could produce and for the attractiveness of these outcomes. Usually, the action with the highest expected utility among the set of available actions is the choice.<sup>11</sup>

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<sup>10</sup> Thomas Schelling, The Strategy of Conflict (New York: Oxford University Press, 1960), p. 4.

<sup>11</sup> Jame D. Morrows, pp. 22-23.

Now that we have considered the fundamental assumptions of game theory, we can begin to describe the elements of a game. Some fundamental questions will be raised and answered in this study: What do the concepts “rational actor,” “strategy,” “payoff” mean? What is a “game tree” and a “game matrix”? How do we conduct a game?

Since this study attempts to apply game-theoretical models to international conflicts, most attention is given to two-by-two models. I acknowledge that we may enlarge the scope of observations and analyses by adding more relevant factors to the basic model. Obviously, the list of factors related to our subject can be extended almost indefinitely. Then, there would be no policy makers intelligent enough to decide without serious consideration of such complicating factors. By contrast, a concise or parsimonious model that renounces some secondary factors can help to clarify “some of the subtle features of the interaction [among the players]-features which might otherwise be lost in the maze of complexities of the highly particular circumstances in which choice must actually be made.”<sup>12</sup>

To avoid getting involved in such a predicament, N-player models ( $N > 2$ ) will be set aside in highlighting mainland China-Taiwan relations, although some ideas derived from them will contribute to our further understanding of international conflicts. The reason we treat mainland China and Taiwan as two major players in the game is that there have been conspicuous conflicting and/or mutual interests between both

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<sup>12</sup> Robert M. Axelrod, The Evolution of Cooperation (New York: Basic Books, 1984), p. 20.

sides during the evolution of mainland China-Taiwan relations. Corresponding to historical evidence, the likely leverage exerted by the potential third party like the U.S. and the U.S.S.R. on mainland China and Taiwan alike will be taken into account. In our analysis, we view the role played by the U.S. or the U.S.S.R. as an ally (term player, relatively temporary or permanent) to Taiwan or mainland China. The U.S. tends to stand by Taiwan because the countries have similar values (capitalism, democratic system, anti-Communists) or the U.S. considers its global strategies and vital interests on Taiwan. By contrast, it is also possible for superpowers to keep good relationship with both countries. In the 1970s, in an effort to deter Soviet expansionism the U.S. sought to normalize the relations with the PRC. In terms of this understanding, the levels of intervention and influence wielded by the U.S. and the U.S.S.R., over time, can be treated as significant factors that may or may not affect the setting of preference orderings and the strategy combinations for Taiwan and mainland China as well.

In theory, there are two major difficulties in the application of the N-person model. According to Snyder, the researchers have to recognize a major player eager to form a coalition among players. Then, What would be the criterion for selecting a leader among players? Moreover, the researchers have to find a “decision point”--a point in time when the binding agreement is determined and payoffs are awarded and distributed among its members (players). Obviously, compared to two-by-two models, N-person theory is vague about the location of this point (or equilibrium).

Typically, the types of game theory under the two-by-two framework are

separated into two categories: (1) the two-person zero-sum game, and (2) the two-person non-zero-sum game. Three classical game-theoretical models, Deadlock<sup>13</sup>, Prisoner's Dilemma, and Chicken, characterized as non-zero-sum games will be introduced from at least two perspectives: their assumptions and characteristics. Also, we will mention a couple of suggested solutions such as increasing communication or decreasing misperception to Deadlock, Prisoner's Dilemma, and Chicken conflict situations which will lead us to evaluate relevant hypotheses concerning game theory, game-theoretical models, and the applications of game-theoretical models to our case study, mainland China-Taiwan relations.

To identify the characteristics and explanatory power of a certain type of model for a specific conflict situation, a brief review of three previous case studies is described and discussed. The three diverse models are the Southwest Pacific Conflict of 1943 based on the framework of Deadlock, the Berlin Crisis of 1958-60 under Prisoner's Dilemma, and Cuban Missile Crisis of 1962 under Chicken. We, like game theorists, assume that no superpower or third party will intervene in each nation's choice. Besides, the government of each nation behaves as a single rational actor struggling for the maximum interests. Then, through the applications of game-

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<sup>13</sup> The term, Deadlock, can be used widely to present any zero-sum game. For descriptions of the deadlock game, see Tzong-ho Bau, "Taipei-Peking Interaction as Two-Person Conflict: A Game-Theoretical Analysis, 1949-88," Issues and Studies, vol. 27, no. 10 (October 1991), pp. 73-74; Glenn H. Snyder and Paul Diesing, Conflict Among Nations (Princeton, N. J.: Princeton University Press, 1975), p. 45.

theoretical models, we will lead our discussion to the major section of this study, i.e., the mainland China-Taiwan relations case study.

### Methods and Hypotheses

Typically, the evolution of mainland China-Taiwan relations is divided into three phases, i.e., 1949-78, 1979-86, and 1987~?. The relevant evidence suggested by scholars to support such period assignment will be mentioned in the literature review. In principle, we agree with this division of time periods. But, we will end the third phase in the year 1995. The mainland China-Taiwan relations for the past four decades in general could be divided into three individual phases: (1) the military confrontation phase (1949-1978); (2) the peaceful competition phase (1979-86); and (3) the premature cooperation phase (1987-1995).

Due to the improvement of diplomatic relations with other countries, especially the establishment of official relations with the United States in January, 1979, mainland China made great changes in its Taiwan policy. Mainland China proposed to Taiwan that “three links” (mail, trade, and tourism) be opened and “four exchanges” (academic, cultural, scientific, and athletic) be initiated. This policy transformation of mainland China was viewed as the expression of a cooperative attitude with which mainland China wanted to reduce bilateral hostility and create an opportunity for peaceful reunification by negotiation between both sides.

Not until 1987 did Taiwan lift its ban on tourist trips to Hong Kong and Macao.

Also, for humanitarian reasons, the government began to allow Taiwan residents to visit their relatives living in mainland China. Partly due to the demands for stable economic growth, but also to the transformation of the political environment, the government of Taiwan was compelled to adapt to the hard-line mainland policy. That is, the government began to formulate and manage its coming trade relations with mainland China in pursuit of new markets and cheap labor. However, they confined the contact between both sides to political affairs and left aside though preliminary exchanges were on the way. To be sure, the changes in exogenous or endogenous conditions from time to time may force both countries to reevaluate the relations between them under a new situation.

Following the end of the Cold War in the 1990s, global conflicts became less likely. The international community tends to constrain or assuage the infrequent upheaval of local conflicts in specific regions such as the middle East or the Eastern Europe in peaceful means.<sup>14</sup> However, it is highly possible that the evolution of mainland China-Taiwan relations would damage regional and global security and stability in the post-Cold War era if the relations get worse or a military conflict occurs. On the other hand, due to the development of democratization in Taiwan, public advocacy for Taiwan independence is no longer illegal. This tendency not only directly encourage the stable growth of the opposition to the Democratic Progressive Party

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<sup>14</sup> Peter Wallensteen and Karin Axell, "Armed Conflict at the End of the Cold War, 1989-92," Journal of Peace Research, vol. 30, no. 3 (August 1993): 331-346.

(DPP), but it also indirectly retards the peaceful movement of across-Strait relations. More negatively, it might provoke mainland China to use force against Taiwan, if Taiwan declares independence. Besides, the pullout of the US troop from Japan, South Korea, and the Philippines has decreased the capacity of the United States to function as a mediator or protector in this region. Taiwan has been under the umbrella of the United States since the outbreak of Korean War of 1950. Obviously, the waning power of the United States has heightened the external threat to Taiwan, especially the military threat from mainland China. More importantly, in recent years due to the release of pressure from the Soviet Union, mainland China has greatly transferred its military deposition from the northeast border to the southeast offshore provinces like Fujian and Guangdong.<sup>15</sup> To be sure, facing such a dramatic transformation in the international environment, Taiwan confronts a great opportunity as well as uncertainty for the future. These endogenous and exogenous factors have forced Taiwan, a country lacking in political resources, to put the first national priority on security rather than sovereignty, to adjust the mainland policy, e.g., to search for cooperation instead of defection with mainland China on across-Strait affairs, and at the same time to pursue more “existing space” in the international community.

In a “White Paper on Cross-Strait Relations” published in July 1994, the government on Taiwan announced that they would “no longer compete with Beijing

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<sup>15</sup> Cheng-yi Lin, “Taiwan’s Security Strategies in the Post-Cold War Era,” Issues and Studies, vol. 31, no. 4 (April 1995): 78-97.

the right to represent China in the international arena.”<sup>16</sup> It is the first official announcement that infers the transformation of national goals, i.e., they prefer security to sovereignty. If that is true, one might be interested in the following question: What would be mainland China’s response to Taiwan transformation, especially in foreign strategies and mainland policies?

No doubt, 1995 is a turning year for the relations across the Taiwan Strait. During the first half of this year, based on the “flexible diplomacy” principle, Taiwan worked hard to foster President Lee’s return to his alma-mater--Cornell University. Not until the end of May, did the Clinton administration, under great pressure from Congress and the Press issue the visa to Lee and promise to mainland China that it is a pure private visit, nothing more. To Taiwan, the meaning of Lee’s US travel is significant. On the one hand, it expresses Taiwan’s strong resolution to struggle for more international space. On the other hand, it makes some Taiwanese believe that Taiwan may achieve international recognition eventually if it sticks to the road of democratization. By contrast, according to the spirit of a white paper titled “The Taiwan Question and Reunification of China”<sup>17</sup> of 1993, and for sovereignty’s sake, mainland China can not abide Taiwan to pursue international recognition. Also, it will not allow other countries to interfere with Taiwan affairs for any reason. It goes

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<sup>16</sup> Free China Journal, January 29, 1993.

<sup>17</sup> Kuo-cheng Sung, “One Peking’s White Paper—‘The Taiwan Question and Reunification of China’,” Issues and Studies, vol. 29, no. 9 (September 1993): 116.

without saying that mainland China's reaction to President Lee's US travel is inflexible. In mid-June 1995, the major mainland Chinese media initiated a large-scale campaign to reprove the so-called private visit of President Lee to the United States from June 7-12. In general, these critiques focused on accusing President Lee of seeking independence for Taiwan.<sup>18</sup> At the same time, mainland China also protested the American government's violation of the principle of the "one China policy" and the spirit of three Sino-US joint communiques.<sup>19</sup>

To express its constant position on the "Taiwan issue", mainland China unilaterally halted the regular meeting between the Straits Exchange Foundation (SEF) and Association For Relations Across Taiwan Straits (AFRATS)<sup>20</sup>. Also, during July and August, it held a series of missile exercises in the East sea, merely 120 miles away from Taiwan. Obviously, using military maneuver as a threat, mainland China wants to force Taiwan to adjust its working diplomacy and mainland China policy. Since the evolution of mainland China-Taiwan in the future is uncertain, ending this case study in 1995 seems adequate.

If the pattern of interaction between both sides changed over time, how did it happen? What are the causal factors? Which models are suitable to explain such a

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<sup>18</sup> see Beijing Review, (Jun. 26-Jul. 2 1995): 5; (July 3-9, 1995): 27; (Aug. 14-20, 1995): 12-13.

<sup>19</sup> see Beijing Review, (Jun. 12-18, 1995): 7, 18; (Oct. 9-15): 4.

<sup>20</sup> Two government-authorized organizations formulated by Taiwan and mainland China respectively aim at dealing with the likely problems or conflicts occurring among people-to-people exchanges from both sides.

happening? Does the current defecting relations make sense under the analysis of game-theoretical models? To answer these questions, Tzong-ho Bau, a professor at National Taiwan University, submitted a workable model in which he separated the interactions and relations between mainland China and Taiwan into three phases, i.e., 1949-78, 1979-86, 1987-88, and assigned a specific game-theoretical model to each phase. Typically, most literature dedicated to the analysis of international crises use only one model, Prisoner's Dilemma or Chicken, to decode a stable conflict situation though this phenomenon may last a long period of time, like the Cold War between the East and the West blocs.

Unlike most analysts who merely adopt one "dominant" model, Bau deals with mainland China-Taiwan relations from the aspect of the dynamics of crisis. That is, he takes advantage of game-theoretical models (Deadlock and Prisoner's Dilemma) to describe and predict the evolution of the relations. This is an original application of game-theoretical models to international confrontation though he does not explicitly account for why the model is shifting over time. In addition, to conduct the game-theoretical analysis, he defined cooperation as "behavior characterized by a high degree of compromise and a low degree of confrontation, and vice versa for defection."<sup>21</sup> Based on this definition (or criterion) , he classified relatively sufficient data such as relevant events, announcements, and policies initiated or issued by both governments

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<sup>21</sup> Tzong-ho Bau, p. 73.

into two categories: (1) defection-oriented; and (2) cooperation-oriented. Then, these two clusters can be utilized as the indicators representing choices of strategies, either cooperation or defection, from both players.<sup>22</sup> To be sure, Bau's criterion is subjective. The reason for doing so probably is that terms such as cooperation and defection constrained by historical context are difficult to define in the abstract. Snyder also made an effort to clarify such vague terms. For example, he identified cooperation (or cooperative strategy) as "a strategy of accepting the other player's demands in whole or in part; making concessions, either all at once or gradually." By contrast, defection is defined as "a strategy of refusing to comprise; standing firm on one's initial demands, exception for minor adjustments."<sup>23</sup> Obviously, Snyder's definition of cooperation or defection covers more relevant elements than Bau's. We acknowledge in the real world that many diplomatic interactions contain both elements of cooperation and defection. That is, these moves would be located somewhere between cooperation and defection if we employ a two-poles continuous scale. Based on the preceding realization, in this study we will classify data in reference to the criteria set by Bau and Snyder as well.

Mainland China and Taiwan alike, as rational actors, are eager to adopt actions to maximize their own primary interests. Due to the practical difficulty in reading policy makers' minds and to illustrate the real policy-making processes on both sides,

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<sup>22</sup> Ibid., pp. 90-95. Appendix: Peking-Taipei Interaction (1949-88).

<sup>23</sup> See, Conflict Among Nations, Glossary section.

document research like Bau's study would be one practicable way. However, conducting the documentary method, researchers may encounter the predicament of how to avoid the bias-oriented selections and descriptions of data which fit our models or hypotheses well and how to accommodate and explain exceptions? To be sure, it occurs in our case study. For example, in selecting a specific phase, 1979-86, while we collect data and label each as cooperative or defecting, we find that the strategies selected by both sides are not constant, neither cooperative nor defecting in total. Facing the players' shift in strategies, game theorists may wonder whether they are applying the correct game model to a given phase. To solve this problem, we can introduce the concept of mixed strategies though it may or may not work as we expect.

Since our case study covers a longer time period than Bau's, and because more data are available, I will try to make some necessary and significant modification to Bau's models, especially in phase division and game-theoretical models applications. In principle, we will go with most of Bau's analysis on the first two phases though I leave room for discussion with respect to the payoffs assigned for both sides in the second phase; as for the third phase, I will extend the time period from 1988 to 1995 and apply Chicken as a model instead of Prisoner's Dilemma used by Bau.

The reason for this modification is Taiwan's change in preference orderings caused the transformation of the structure in the game, i.e., as a model Chicken is more acceptable than Prisoner's Dilemma in this situation. In addition, we remain skeptical about the solution of "tit for tat" that Bau proposes for the second and the third phases.

The hypothesis--the more vulnerable party (like Taiwan) is always sensitive to any possible change of policy by its opponent (like mainland China)-- initiated but not developed by Bau, will be used as one of major assumptions (up to the third phase Taiwan is more seriously concerned with its security than sovereignty) to reinforce our argument that Taiwan is compelled to play Chicken while mainland China can freely shift its strategy between cooperation and defection.

Before moving into our case study, I will review and examine a couple of hypotheses from the broad perspective of game theory. Also, I will use these hypotheses to explain and analyze mainland China-Taiwan relations, such as:

1. Collective rationality is more workable on increasing interest to the players than individual rationality in an interest-conflict game like Prisoner's Dilemma or Chicken. Cooperation is preferable to defection.
2. The more opportunity for the players to communicate before or during a game; the more possibility for both sides to choose a cooperative strategy instead of defecting one. For example, due to the exchanges between both sides after 1987, the mainland China-Taiwan relations moved the peaceful competition phase into the premature cooperation phase.
3. Decision-makers are more liable to search for cooperation in the context of a repeated game than a one-shot game.
4. The players can be encouraged or forced to adopt cooperation while the structure of the game is changed. For example, mainland China began to play a

Prisoner's Dilemma game instead of a Deadlock after 1979. Change of attitudes in mainland China on the one hand caused the reorganization of the payoff matrix yet on the other hand directly encouraged Taiwan to adjust its strategies and preference ordering in a new game.

5. Compared to Prisoner's Dilemma, Chicken is more conducive to cooperation because the players in Chicken will suffer costly penalties if they decide to defect with one another.

In addition, I consider two methodological elements, i.e., the subjective recognition of the players and the objective constraint of the conflict situation, when we assign a game-theoretical model to a given situation. The reason to select Chicken in comparing the basic framework for the explanation of mainland China-Taiwan relations in the third phase is that Chicken is much more conducive to promote a binding agreement to cooperate on both sides due to costly penalties (e.g., war). Also, Taiwan is liable to adhere to the cooperative strategy (i.e., play Chicken) because of lack of political resources and the consideration of security as well.

To enhance our understanding of mainland China-Taiwan relations, this case study is dedicated to answering questions such as: Is there any change of foreign policies (or strategies) in both countries during the past four decades? What kinds of factors cause the change of relationship between both sides? Could game-theoretical models help us to find any characteristic of the interaction when we compare the past to the current experience? Through the study of the characteristics of game theory and game-theoretical models, we suggest the following hypothesis: Chicken is more

suitable compared to Prisoner's Dilemma in analyzing mainland China-Taiwan relations in the post-Cold War era.

## CHAPTER II

### METHODOLOGICAL FRAMEWORK

#### Introduction

Before going further with the applications of game-theoretical models to mainland China-Taiwan relations, we should take a closer look at game theory. In this chapter, I introduce some general definitions of game theory. The fundamental concepts derived from the definitions like rationality and expected utility will be described. Also, to clarify the intimate association between game theory and the rational choice theory, I briefly contrast them to point out how game theory develops from the rational choice theory. In this chapter, I also discuss the characteristics and elements of a game, the vernacular of game theory (i.e., game tree and game matrix), and the types of two person games.

#### Definitions of Game Theory

Game theory can be defined as the study of conflict and cooperation between rational decision-makers using concise game-theoretical models.<sup>24</sup> There are at least three significant elements within this definition: (1) we can calculate the consequence

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<sup>24</sup> Roger B. Myerson, Game Theory: Analysis of Conflict (Cambridge, Massachusetts: Harvard University Press, 1991), p.1.

of behavior adopted by players and predicted using game theory; (2) players are supposed to oppose each other in different interests; (3) players in a game are intelligent, especially rational as to their own goals and actions. McMillan identifies game theory as “the study of rational behavior in situations involving interdependence.” By interdependence, we mean that what they do will affect the players in the game and the others’ responses during the strategy making processes. Put another way, the outcome of the game depends on each player’s action-- no one individual has full control over what happens.

According to McMillan, the players are aware of these interdependences so, to a certain extent, that might constrain their reactions. In addition, the concept of interdependence implies a certain competition (or conflict situation) among the game players. Due to the relationship (interdependence) among the players, a rational action in a game must be derived from a prediction of others’ responses. That is, by putting yourself in the other player’s position and predicting what kind of action he will adopt, one, as a rational actor, can react with best action.<sup>25</sup> Rapoport argues that game theory is not dedicated to describe how actual people make decisions in conflict of interests situations; rather it is intended to explain “how certain idealized actors, called rational players, can be expected to make decisions in such situations.”<sup>26</sup>

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<sup>25</sup> John McMillan, Games, Strategies and Managers (New York: Oxford University Press, 1992), pp. 6-7.

<sup>26</sup> Anatol Rapoport, Melvin J. Guyer, and David G. Gorden, The 2X2 Game (Ann Arbor: The University of Michigan Press, 1976), p. 3.

To be sure, such a statement as this may invite a certain suspicion concerning the power of game theory to explain the real world. That is, game theory may be subject to serious criticisms such as: the models are formulated to be too simple/unrealistic to represent all possible states of the world. If so, is there any advantage of game theory which has attracted political scientists to study and apply it? By highlighting the players' preference orderings and strategy interactions, game theory, to a certain extent, may increase the chance that we will identify the fundamental conflicts among the actors. Other factors that help increase our understanding are (a) knowing the actors' preference orderings and strategies, (b) how a rational actor achieves his maximum benefits (or expected goals) while he considers other actors, and (c) why a rational actor could and should respond in particular way. In other words, we can say that the primary contribution of game theory is not only to study the conflict of interest and conflicting behavior in terms of a concise framework in which a strategic interaction is simplified; but also to predict what the players will do in the game, and thus generate testable hypotheses.

To capture the relevant characteristics of game-theoretical models, it is worth referring to two fundamental assumptions concerning game theory, i.e., (1) the concept of rationality, and (2) expected utility (or utility theory).

### Concept of Rationality

Game theory as the most highly developed rational model of politics is based on the assumption of rationality. Rationality is an ambiguous concept which has

generated controversy and confusion in social science, especially in political science.

In his book, Theory of Political Coalitions, Riker characterizes the concept of rationality as follows:

The rationality assumption asserts that there is something about people that makes them behave in a regular way, just as in physical science that mechanical assumption is made that there is something about things that assures us they will move regularly. In both cases there is an assumption that things behave in a regular way.<sup>27</sup>

Riker's identification of rationality is such that we could label someone or his behavior rational if he behaves in a regular way. Moreover, "a regular way" may imply that either the actors or the outsiders learning the lessons from others' experience know exactly what to do under a similar situation. In contrast, Fiorina's definition of rationality goes further. He argues that the assumption of rational behavior means no more than the notion that "individuals engage in maximizing behavior." Besides, the individual can choose the alternatives available to him which would return the maximum "expected benefits" under the minimum costs.<sup>28</sup> Rapoport has a similar perception of rationality stating that we call an individual rational if he takes into account the possible consequences of each course of action open to him; if he is aware of a certain preference ordering among the consequences and accordingly chooses the course of action that, in his estimation, is likely to lead to the most

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<sup>27</sup> William H. Riker and Peter C. Ordeshook, An Introduction to Positive Political Theory (Englewood Cliffs, New Jersey: Prentice-Hall, 1973), p. 11.

<sup>28</sup> Morris Fiorina, 1981, p. 198.

preferred consequence.<sup>29</sup> Also, Dahl has his own recognition of rationality as “an action is rational to the extent that it is correctly designed to maximize goal achievement, given the goal in question and the real world as it exists.”<sup>30</sup>

The description implies that rational behavior consists of at least three critical elements (1) intention to maximize primary interests, (2) usage of the best means, and (3) goal-oriented behavior. In addition, we assume a rational means is recognized as the most efficient instrument that would help an actor to achieve a selected goal. We never label results as rational, only the means to achieve the ends. We evaluate an action as rational or not according to the choice of means available to achieve a certain goal.<sup>31</sup>

What is the scope of rationality? Usually, rationality leads us to what we ought and can do for the sake of attainment of our expected goals. Which actions will be labeled rational by what kind of criteria? To address this question, we should first scrutinize the optimizing relationship between the desires and the beliefs of the actors. That is, a rational action should be the best way of satisfying the actor’s desires based on his beliefs. Or, in Olson’s words, an individual’s actions are rational when his

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<sup>29</sup> Anatol Rapoport, Fights, Games, and Debates (Ann Arbor: The University of Michigan Press, 1967), pp. 107-108.

<sup>30</sup> Robert Dahl and Charles Lindblom, Politics, Economics, and Welfare (New York: Harper & Row, 1953), p. 38.

<sup>31</sup> Alan C. Isaak, Scope and Methods of Political Science (Pacific Grove, California: The Dorsey Press, 4th ed., 1985), p. 234.

objectives are “pursued by means that are efficient and effective for achieving these objectives.”<sup>32</sup>

Borrowing Elster’s model, Figure 1 below represents the interaction among these concepts.<sup>33</sup>

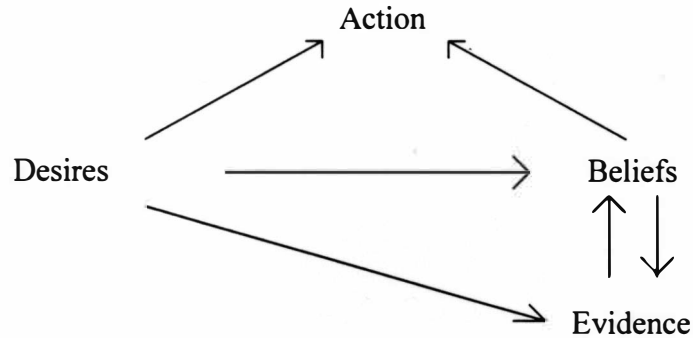


Figure 1. The Interaction Among Concepts.

The procedure for the evolution of rational action is demonstrated in the following model (Figure 2).<sup>34</sup>

In principle, rational action consists of three relevant operations (1) finding the best action based on given beliefs and desires; (2) formulating the best-grounded belief derived from given evidence; and (3) collecting the right amount of evidence

<sup>32</sup> Mancur Olson, The Logic of Collective Action (Cambridge: Harvard University Press, 1965), p. 65.

<sup>33</sup> Jon Elster formulates this model to discriminate rational actions from irrational ones. see Jon Elster, “When Rationality Fails,” The Limits of Rationality (Chicago: University of Chicago Press, 1990), p. 32.

<sup>34</sup> Ibid., p. 33.

for given desires and prior beliefs.<sup>35</sup>

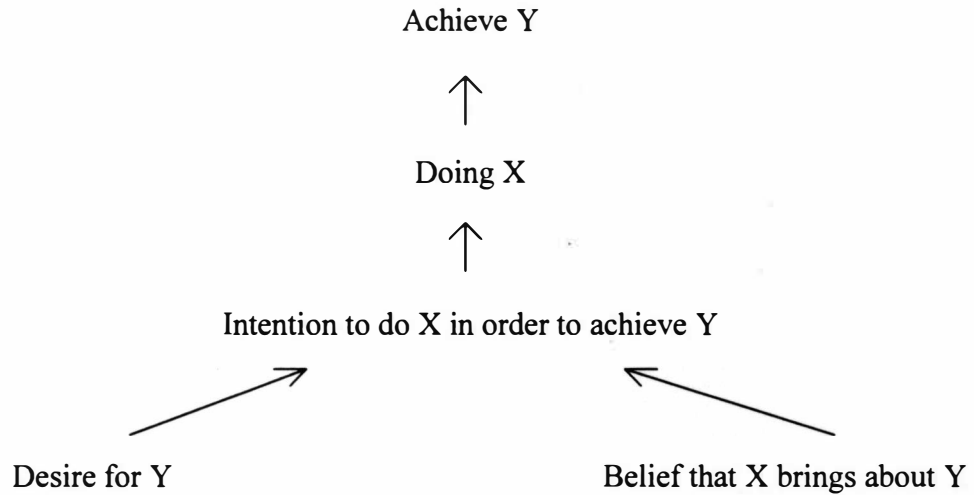


Figure 2. The Evolution of Rational Action.

To be sure, the characteristics of the rational choice theory can be summarized as (a) theorists assume people have goals that they attempt to achieve, (b) theorists assume people have some freedom of choice, (c) theorists assume that individuals choose actions they believe will achieve their goals, and (d) theorists deliberately simplify and abstract reality in their models.<sup>36</sup>

In their article, “The Limits of Rational Theory,” Goldfield and Gilbert also identified several assumptions for rational choice theory. First, they contend that individuals have relatively fixed or constant preferences. The preferences are

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<sup>35</sup> Jon Elster, pp. 20-21.

<sup>36</sup> James D. Morrow, Game Theory for Political Scientists (Princeton, New Jersey: Princeton University Press, 1994), pp. 7-8.

invariant and exogenous. The preferences are ranked in a consistent, hierarchical preference structure. In other words, an individual's preferences are viewed as expressions of his perceived self-interest, measurable in quantitative units, like money. Second, they note that individuals act to maximize their preferences (or self-interest). While, the parameters of choice which involve preference structures, a utility function can represent the feasible set of options, means, and costs. That is, to understand human actions as rational is to understand them as actions by individuals to maximize their utility functions. In addition, in order to achieve their goals with other similarly rational individuals who have their own well-defined self-interest, individuals attempting to maximize their self-interest compete and cooperate. This complicated web of interaction among actors will form or reach an equilibrium.<sup>37</sup>

Like the rational choice approach, game theory makes it possible to apply the concept of rationality to the real world. Game theory assumes that the actors confronting any real world conflict situation will behave rationally. Next, game theory describes the essential characteristics of a given situation, especially through concise game models. Finally, game theory helps us to explain and predict why, what, and how the actors behave.

So far, we have confirmed that game theory is based on the assumption of rational actors. We may raise relevant questions such as: What would happen in a

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<sup>37</sup> Michael Goldfield and Alan Gilbert, "The Limits of Rational Choice Theory," Rational Choice Marxism, Terrell Carver and Paul Thomas, eds. (University Park, Pennsylvania: The Pennsylvania University Press, 1995), pp. 276-277.

game if the players act rationally? Could rational behavior, in practice, guarantee an expected (or rational) outcome in return? In his book, An Economic Theory of Democracy, Downs says “in reality, men are not always selfish, even in politics. They frequently do what appear to be individually irrational because they believe it is socially rational....”<sup>38</sup>

His notion with respect to rationality points out a specific perspective, i.e., individual rationality versus collective rationality. More literature about this contrast will be posed in a latter section dedicated to non-zero sum game models.

### Expected Utility

In principle, game theorists assume that each individual is rational and eager to maximize the expected value (or utility) of his own payoff, measured on some utility scale.<sup>39</sup> In this spirit, Fishburn notes that “expected utility has served for more than a generation as the preeminent model of rational preferences in decision making under conditions of risk.”<sup>40</sup> In other words, We can apply game-theoretical analysis “only if the payoffs entered in the game matrix actually represent utilities given on an

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<sup>38</sup> Anthony Downs, An Economic Theory of Democracy (New York: Harper, 1957 ), p. 9.

<sup>39</sup> Duncan R. Luce and Howard Raiffa, Games and Decisions (New York: John Wiley & Sons, 1957), p. 50.

<sup>40</sup> Peter C. Fishburn, Nonlinear Preference and Utility Theory (Baltimore: Johns Hopkins University Press, 1988), p. 1.

interval scale.”<sup>41</sup>

What distinguishes game-theoretical models from other models of rational choice is that the outcome assumes to be contingent on the choices of more than one player. That is, the preferences of other players, and choices consistent with these preferences, must be explicitly considered when one chooses an optimal action. In addition, game theorists assume that the players have preferences to a set of outcomes which are fixed and that change in the situation and the information available to the players. By choosing the outcomes carefully, “shifts in preferences” are shifts in preferences among actions, rather than outcomes.<sup>42</sup> The player preferences in a game are expressed on a utility scale.

Ordinal and interval scales are frequently used in game theory. To say that a person’s preferences can be measured on an ordinal scale simply means that they are in an order. In other words, the various possible outcomes of a situation can be laid out along a line so that for any two outcomes the preferred one lies to the left of the other.<sup>43</sup> To say that an individual’s preferences fit an interval scale means that those preferences satisfy an ordinal scale and the individual can give consistent statements of preference between probabilistic lotteries. An ordinal scale can represent the notion

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<sup>41</sup> Anatol Rapoport, The 2X2 Game, p. 71.

<sup>42</sup> James D. Morrow, p. 19.

<sup>43</sup> Henry Hamburger, Game as Models of Social Phenomena (San Francisco: W. H. Freeman and Company Press, 1979), p. 36.

that one thing is preferred to another but no one thing is preferred by a wide or narrow margin. By contrast, the interval scale puts an exact numerical value on the amount by which one is preferred to another.<sup>44</sup> A descending sequence can represent ordinal preferences of numbers. The highest number is assigned to the most preferred outcome, the second-largest number to the next outcome in the preference order, and so on down to the least preferred outcome.

We call these numbers utilities, and the function that maps from consequences to numbers that represent an individual's preferences over those outcomes is a utility function. With ordinal preferences, the larger the number the better the outcome, however, the difference between the numbers assigned to two outcomes is meaningless.<sup>45</sup> Also, Axelrod argues that the unit points bestowed are arbitrary. The utility scale is an interval like the scale on a thermometer. The utility is an index of the preferences of the player himself and, in theory at least, is measured by observing the choices the player makes when confronted with diverse alternatives.<sup>46</sup>

According to the assumption of utility theory, the subject's preferences among alternatives come prior to our numerical characterization of them. That is, we do not want to slip into saying that a player prefers A to B because A has the higher utility;

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<sup>44</sup> Ibid., p. 36-8.

<sup>45</sup> James D. Morrow, p. 20.

<sup>46</sup> Robert Axelrod, Conflict of Interest, pp. 16-17.

rather, because A is preferred to B, we assign A the higher utility.<sup>47</sup>

Von Neumann and Morgenstern formulated utility theory based on the following assumptions:

1. Given two alternatives, a person either prefers one to the other or is indifferent.
2. Certain well-defined chance events having probabilities attached to them are manipulated according to the rules of the probability calculus.<sup>48</sup>

Utility is a measure of an actor's preferences over the outcomes that reflects his or her willingness to take risks to achieve desired outcomes and avoid undesirable outcomes. The relationship between preferences and utility function is that a preferred option will have a higher expected utility, i.e., to a rational actor, what he is eager to do is maximize his utility based on his preferences. If so, how does a utility function predict actions? What is its relationship with the expected utility? According to the utility function formulated by von Neumann and Morgenstern, any decision problem can be described formally as (a) a set of acts, "A," one of which will be chosen as the decision.(b) A set of states of the world, "S." The states are mutually exclusive and Only one can occur, and one state must occur. The " world" is defined to encompass all matters about the problem beyond the control of the decider. An event is a subset of the states.(c) A set of consequences or outcomes, "C," with one consequence for

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<sup>47</sup> Luce & Raiffa, Games and Decision, p. 22.

<sup>48</sup> Ibid., p. 371.

each pair of acts and states.(d) A preference ordering to the consequences, “P.” These preferences are assumed to be complete, transitive, and fixed.

We can calculate the expected utility for an action by multiplying the probability of each state’s occurring by the utility of the outcome that results from that state and the action, then summing these products over all the possible states. The available action with the highest expected utility is the choice. In mathematics, we have the following:

$$EU(A) = \sum_{\text{all } S} P(S) U[(S, A)] \text{ and choose } A \text{ such that } EU(A) \text{ is maximized.}$$

### Characteristics of a Game

Rapoport defines the cardinal characteristics of a game:

1. Sets of decision makers are called players. A set consists of at least two players.
2. At specified instances, one or more players must decide by choosing among a specified set of alternatives. These decisions determine the resulting situations of the game. Thus, a play of a game is a sequence of situations.
3. Each situation, in turn, determines which of the players is to make the next decision (“move”) and the range of choices available.
4. Certain specified situations define the end of the particular play of the game.

5. A situation in which a particular play of a game ends is called an outcome of the game. Associated with each outcome is a set of payoffs, positive or negative numbers, one awarded to each player. The payoffs represent gains or losses.

6. A rational player is one who, having taken into account all the information available to him by the rules of the game, makes choices in a way that maximizes the actual or the statistically expected payoff to accrete to him (and to him only) in the outcome of the game.<sup>49</sup>

To be sure, a game consists of players as rational actors, alternatives (or strategies), and payoffs. A strategy can be identified as a complete description of how one will behave under every possible circumstance.<sup>50</sup> A rational player will adopt a strategy (or adapt a working strategy) conducive to achieve his selected goal before playing a game or during a game. Rapoport's statement implies that the structure of the game would constrain the players' strategies and payoffs. Also, the preceding move can constrain the next decision.

This proposition reminds us of the difference between one-shot games and iterated games. Overall, in a one-shot game, each player searches for a dominant strategy, if any, and plays the game tough. The outcomes for the players are either wins or losses as there is only one chance to play, and any retaliation is impossible.

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<sup>49</sup> Anatol Rapoport, The 2X2 Game, p. 4.

<sup>50</sup> Morton D. Davis, Game Theory--A Nontechnical Introduction (New York: Basic Books Press, 1970), p. 10.

By contrast, in an iterated game, each player may try to cooperate for the sake of collective benefits and to restrain oneself from adopting defecting strategy for the sake of avoiding retaliation. Compared to one-shot games, iterated games are inclined to promote cooperation, especially in non-zero sum game situations, like Prisoner's Dilemma and Chicken.

Hamburger also identifies four basic ingredients of a game-theoretical analysis: the players, their options, the possible results, and the players' preferences among those results.<sup>51</sup> A game-theoretical analysis pays attention to questions such as: Whom has decisions to make? What are the different options available? What will be the results of the various possible combinations of choices? Which results are preferred by whom?

These relevant questions in practice can be described and discussed by the languages of game theory, called game trees and matrices.

### Tree Descriptions

#### Game 1: Card Game

At the beginning of this game, player 1 and 2 each put a dollar in the pot. Player 1 draws a card from a shuffled deck in which half the cards are red (diamonds and hearts) and half are black (clubs and spades). Player 1 privately looks at his card and decides to raise or fold. If Player 1 folds then he or she shows the card to Player 2

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<sup>51</sup> Henry Hamburger, p. 11.

and the game ends. Then, Player 1 takes the money in the pot if the card is red, but Player 2 takes the money in the pot if the card is black. If Player 1 raises then he or she adds another dollar to the pot and Player 2 must decide whether to meet or pass. If Player 2 passes, then the game ends and Player 1 takes the money in the pot. If Player 2 meets, then he or she also must add another dollar to the pot, and the Player 1 takes the money in the pot if the card is red, and Player 2 takes the money in the pot if the card is black.

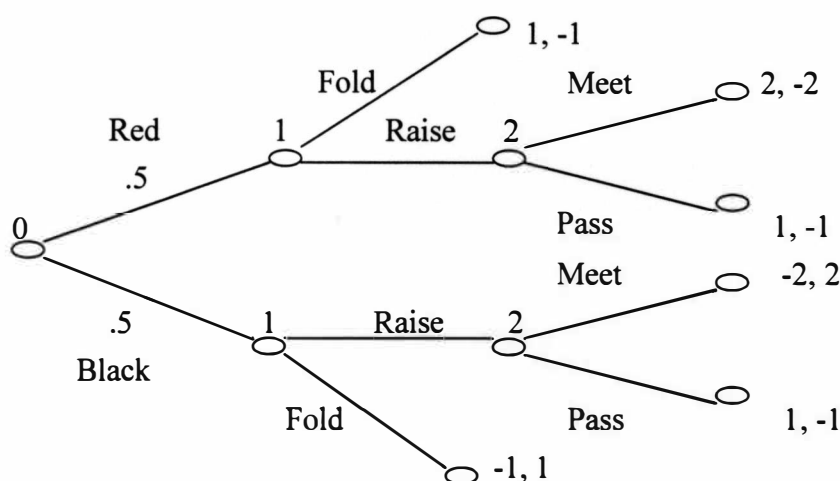


Figure 3. Card Game (1).

Figure 3 is a tree diagram that shows the possible events that could occur in this game. The tree consists of a set of branches, each that connects two points called nodes. The leftmost node in the tree is the root of the tree and represents the beginning of the game. There are six nodes in the tree. These nodes are called terminal nodes and represent the possible ways that the game could end. The outcomes to each player are allocated at terminal nodes respectively. A path of

branches represents each possible sequence of events that could occur in the game from the root to one of these terminal nodes. When they play the game, they call the path that represents the actual sequence of events that will occur the path of play. The goal of game-theoretical analysis is to try to predict the path of play. We give the node a label “0” (zero) if chance determines the event not by a player. In Figure 1, the root has label “0” because the color of the card that Player 1 draws is determined by chance. Each of the two branches following the root has probability .5, because half of the cards in the deck are red and half are black. A non-terminal node with a label other than zero is a decision node. When the next branch in the path of play would be determined by the player named by the label, e.g., “1” represents decisions made by Player 1.

In Figure 4, each decision node has two labels, separated by a decimal point. To the left of the decimal point, we write the player label which indicates the name of the player who controls the node. To the right of the decimal point, we write an information label, which shows the information state of the player when he moves at this node. So the label “1.a” indicates a node where Player 1 moves under the information state “a,” and the label “2.0” indicates a node where Player 2 moves under the information state “0.” In addition, Player 1’s information state “a” is the state of having a red card, Player 1’s information state “b” is the state of having a black card, and Player 2’s information state “0” indicates the state of knowing that Player 1 has raised. The only significance of the information labels is to express sets

of nodes that can not be distinguished by the player who controls them. Thus, because Player 1's nodes have diverse information labels but Player 2's nodes have the same information labels. This situation implies that Player 1 can distinguish his two nodes when he moves, but Player 2 can not distinguish her two nodes when she moves.

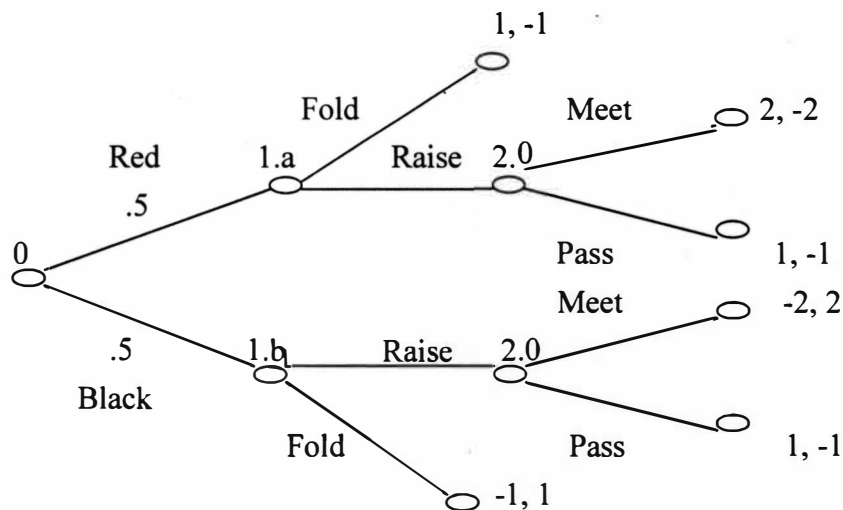


Figure 4. Card Game (2).

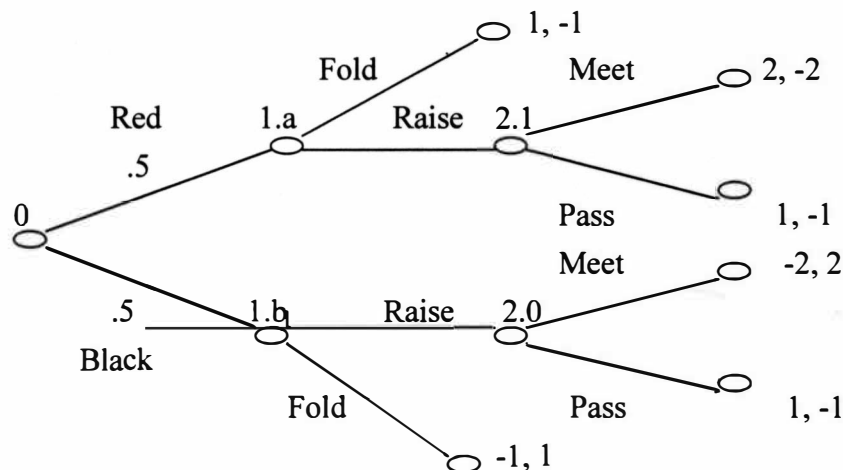


Figure 5. Card Game (3).

Compared to Figure 4, Figure 5 indicates a game with perfect information. A game is one of perfect information if each player's location on the game tree can be inferred from the preceding decisions. In our case, Player 2's nodes have different information about Player 1's moves. That is, Player 2 can immediately decide which strategies to adopt when she gets the information that Player 1 has raised because he draws a red or black card.

In general, we can easily identify three features of game trees: (1) players have more than one move or strategy; (2) moves are not made simultaneously; and (3) the results of all preceding moves are always made public so that these are games of "perfect information."<sup>52</sup>

### Matrix Descriptions

#### Game 2: Matching Pennies

In this two-person game each Player takes a penny and places it either head-up or tail-up and covers it so the other Player cannot see it. Both player's pennies are then uncovered simultaneously. One player is called Matchmaker. This player gets both pennies if they show the same face (both heads or tails). The other player is called Variety-seeker. This player gets the pennies if they show opposite faces (one head and one tail).

A simple matrix can represent the entire description of Game 2 containing all

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<sup>52</sup> Ibid., p. 16.

the key information.<sup>53</sup> Thus in Matrix 1, Matchmaker may choose the top row (heads) or the bottom row (tails). Variety-seeker may pick the left or right column.

		Variety-seeker	
		Heads	Tails
Matchmaker	Heads	+1	-1
	Tails	-1	+1

Figure 6. Matrix 1: Matching Pennies.

Their two choices together determine a box or cell of the matrix. For example, if both pick tails, the result is the lower-right cell, in which we find the number “+1.” This number is the payoff to Matchmaker, showing that Matchmaker wins one penny in this game (because he keeps his own penny, his net change in wealth is +1). This parlor game is a zero-sum game, since money is neither created nor destroyed. The matrix has been made from Matchmaker’s point of view, so that, for example, it has “-1” when he loses. Giving payoffs only for the row-choosier in a zero-sum game is conventional, and this has been done in Matrix 1. Since Matchmaker’s loss is Variety-seeker’s gain, one could deduce Variety-seeker’s payoffs simply by replacing plus signs with minus signs and vice versa in Matrix 1. Notice that the matrix clearly

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<sup>53</sup> This matrix is borrowed from Henry Hamburger. More discussion, see Henry Hamburger, Game as Models of Social Phenomena, pp. 12-13.

displays the names of the players, the options available to them, and the way in which those options can interest to give results. In addition, the preference orderings to each player should be considered because a rational player is supposed to choose the strategy based on his preferences.

Compared to game trees, matrices have been used to represent simultaneous choices for two players, while trees have merely allowed us to express a succession of moves, usually with a player knowing everything done up to the time of particular decision.<sup>54</sup> In other words, game trees can display the relatively integral decision-making process by containing information with respect to players' moves.

#### Translating Trees Into Matrices

In Figure 7 (game tree), Player A has two possible strategies, a and b. In contrast to Player B, complete contingency plan (strategy) is more complicated because Player B make sure what he will do in response to Player A and do not have any information what Player A will do. Player B's possible strategies are for the following: (Figure 7)

The matrix 2 that corresponds to game tree is found by pairing up the choices of the two players. For example, if Player A adopts strategy a and Player B has left instructions to use the strategy d-e, the result is the Player B ends up actually using

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<sup>54</sup> Ibid., p. 26.

branch e of the tree, so the payoff is D.<sup>55</sup>

(1) Strategy 1, c-e

if player A has adopted a, then choose c;

if player A has adopted b, then choose e.

(2) Strategy 2, c-f

defined similarly as above.

(3) Strategy 3, d-e

defined similarly as above.

(4) Strategy 4, d-f

defined similarly as above.

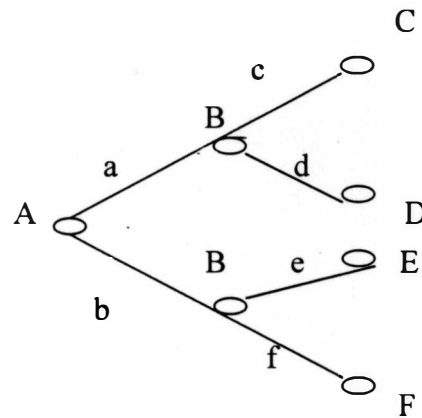


Figure 7. Game Tree.

		Player B			
		c-e	c-f	d-e	d-f
Player A	a	C	C	D	D
	b	E	F	E	F

Figure 8. Matrix 2: Translating Game Tree Into Matrix.

### The Types of Games for Two-Person

There is no one universal model which can represent all games under diverse conditions. Overall, two-person games are designed under the consideration of

<sup>55</sup> The author adopts Hamburger's rules to explain how game trees are translated into matrixes. See, Henry Hamburger, Games as Models of Social Phenomena, pp. 26-30.

payoffs, the number of games, and information.

According to these elements, two-person games can be created in different types such as: (a) two-person, zero-sum, finite game of perfect information; (b) two-person, zero-sum, unlimited game of perfect information; (c) two-person, zero-sum, finite game without perfect information; (d) two-person, zero-sum, unlimited game without perfect information; (e) two-person, non-zero-sum, finite game of perfect information; (f) two-person, non-zero-sum, unlimited game of perfect information; (g) two-person, non-zero-sum, finite game without perfect information; (h) two-person, non-zero-sum, unlimited game without perfect information.

In a two-by-two game, either zero-sum or non-zero-sum, one player or both may or may not have a dominant strategy. If there is one, then the game is strictly determined because those players with a dominant strategy will choose it.

Matrix 3 indicates a game with dominant strategies for both players. The top row is a dominant strategy for Player A since 5 exceeds 1 and 4 exceeds -2. The right column is a dominant strategy for Player B since -4 exceeds -5 and 2 exceeds -1 (this is a zero-sum game, Player B's payoffs are the negative of those for Player A).

		Player B	
Player A	5	4	
	1	-2	

Figure 9. Matrix 3: Game With Dominant Strategies.

The major difference between a zero-sum game and a non-zero-sum game is that in a zero-sum game the payoff to one player is at the cost of the other player. Thus, the net payoff is always zero. Besides, as we mention above, if the game is played only once, i.e., a one-shot game, then it is expected that both players will adopt a dominant strategy that could maximize his expected utilities or payoffs. By contrast, if the game is played more than once, i.e., an iterated game, then choosing a cooperative strategy to increase payoffs is possible for both players, especially in a non-zero-sum game.

### Conclusion

The goal of game-theoretical analysis is an attempt to predict how the participants as rational players will decide under a conflict situation. Based on the assumption of rationality, game theory shares a couple of similar features with the rational choice theory. Elster has pointed out these common characteristics, and included: (a) both theories assume that people have expected goals according to personal preference orderings; (b) both theories assume that individuals choose actions that they believe will achieve their goals; (c) both theories tend to simplify and abstract the reality in their models. In addition, game theory concentrates on decision interdependence among the players while the rational choice theory focuses on personal decision.

The concept of expected utility initiated by von Neumann and Morgenstern is another central assumption in game theory. By combining utility theory with

rationality, game theorists can show the following hypothesis: the players' actions are determined by their preference orderings in which the highest rank of preference is assigned the largest utility, i.e., they will choose the action that will bring the largest utility in return, when other things are equal. In this chapter, we have used Rapoport's analysis to describe the relevant characteristics and elements of a game. Also, we introduced two general ways to make up a game; that is, by game tree and game matrix. Finally, we recognize the most common types of games for two-person so that we might introduce three well-known game models in the next chapter.

## CHAPTER III

### GAME-THEORETICAL MODELS

#### Introduction

Games, in principle, can be divided into two types: zero-sum and non zero-sum. The difference between both clusters lies in the pattern of payoffs. Due to the lack of mutual interests, the payoffs for the players in zero-sum games are assigned in accordance with the principle of zero-sum; the more one obtains, the more the others lose. By contrast, the players in non zero-sum games may cooperate with one another to escalate individual payoffs because the payoffs derived from cooperation overweighs that from bilateral defection.

Typically, Deadlock as a game model, focusing on total conflict among the players, describes general zero-sum games. Unlike Deadlock, Prisoner's Dilemma and Chicken, two well-known game models for non zero-sum games, are used to explain the situation in which interest and conflict are mixed. In this chapter, I distinguish between zero-sum and non zero-sum game models. Also, I describe various solutions to game-theoretical models such as the "tit for tat" strategy and mixed strategies. Before our introduction of major game-theoretical models, a couple of relevant concepts are worth addressing, e.g., equilibrium, Nash equilibrium,

saddle points, the minimax (or maximin) principle.

### Equilibrium, Nash Equilibrium and Saddle Points

In theory, the concept of equilibrium displays the notion of rational actions in a given situation in which each rational actor adopts his best strategy available, restrained by others and the structure of the game he faces.<sup>56</sup> Besides, an equilibrium can be regarded as a prediction for a specific situation concerning the choices of the actors and the corresponding outcomes. Ordeshook contends that this prediction always fit into the type “if people’s preferences are...then the only choices and outcomes that can endure are....” Put another way, the function of the concept of equilibrium is that it can replace both “journalistic interpretations of events and statistical correlations between environmental factors and political outcomes as explanations.”<sup>57</sup>

The game-theoretical concept of equilibrium represents “a certain meshing of everyone’s social structure: no actor has any incentive to act differently at an equilibrium, which means that there is no tendency to structural alteration.”<sup>58</sup>

The work of Nash influences the idea of equilibrium (1950). Nash equilibrium, in principle, can be viewed as a perfect equilibrium if it is stable with

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<sup>56</sup> Cristina Bicchieri, p. 1.

<sup>57</sup> Peter C. Ordeshook, Game Theory and Political Science (Cambridge: Cambridge University Press, 1986), p. 13.

<sup>58</sup> A. Carling, Social Division (London: Verso, 1991), p. 276.

respect to small perturbations in the players' strategies, i.e., if each player's equilibrium strategy is a best reaction to the opponent's strategy and to some slight perturbation of that strategy.<sup>59</sup> An optimal strategy for a certain player, according to Harsanyi, is recognized as a best reply to the other players' strategies if it could maximize this player's payoff so long as the other players' strategies are kept constant. Then, a given strategy pair (containing exactly one strategy for each player) is called an equilibrium point (or Nash equilibrium).<sup>60</sup> In general, a Nash equilibrium occurs if there is a potentially self-reinforcing agreement; therefore, each individual "does what is best for her given what others do."<sup>61</sup>

"Saddle points" initiated by Rapoport, is another significant game-theoretical concept related to equilibrium though not as popular as Nash equilibrium. The center of a saddle is the lowest point on the horse's back in the horse's longitudinal plane, i.e., as one moves from front to back, (and at the same time the highest point in the plane perpendicular to the horse's move, i.e., as one slides from side to side). In other words, the saddle point is simultaneously a minimum and a maximum. In a game matrix, a saddle point may be recognized if the cell is both the smallest in the

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<sup>59</sup> R. Selten, "Re-examination of the Perfectness Concept for Equilibrium Points in Extensive Games," *International Journal of Game Theory*, vol. 4, pp. 22-55.

<sup>60</sup> John C. Harsanyi, "Advances in Understanding Rational Behavior," Rational Choice, Jon Elster, ed. (New York: New York University Press, 1986), p. 92.

<sup>61</sup> Adam Przeworski, Democracy and the Market (Cambridge: Cambridge University Press, 1991), p. 20.

corresponding row and the largest in the corresponding columns.<sup>62</sup> A saddle point is viewed as an equilibrium, especially in zero-sum games.

For example, Matrix 4 (Figure 10) represents a game with a saddle point and a stable outcome as well. Neither player has a dominant strategy. Focus on the center cell in which Player A would get 2 while Player B gets -2. What will happen if Player A alters his choice while Player B sticks to the center column? The consequence will be that Player A gets 0 or 1, both less than 2. To Player A, no changing his choice is wise. In contrast, if Player B alters his choice while Player A sticks to the center row, then Player B gets -3 or -4, both less than -2. Obviously, staying is wise for Player B (the center cell). Here, the center cell is named as a saddle point.

		Player B		
Player A		5	0	-3
		3	2	4
		-2	1	6

Figure 10. Matrix 4: Game With a Saddle Point.

The idea of equilibrium, Nash equilibrium, and Rapoport's saddle points all stem from the fundamental assumption that in a so-called equilibrium situation no

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<sup>62</sup> Anatol Rapoport, Two-Person Game Theory--The Essential Ideas (Ann Arbor: The University of Michigan Press, 1966), pp. 60-62.

actor wishes to change his behavior on his own. That is, behavior at an equilibrium is stable in the sense that no actor given his current position and knowledge, can improve his own position on his own though an equilibrium is not assumed to be fair or balanced to the actors or desirable according to any ethical criteria.<sup>63</sup> A Pareto-optimal outcome will come out with an equilibrium.<sup>64</sup>

### Minimax or Maximin Principle

The minimax principle is derived from the concept of saddle points. Suppose there exists a number “V”, a pure strategy (a maximin strategy) for Player A which will guarantee him on achieving at least V, and at the same time the other pure strategy (a minimax strategy) for Player B, which will guarantee that Player A gets at most V. Also, these strategies are in equilibrium when any pair of pure strategies produce a maximin and a minimax strategy for Player A and Player B respectively.<sup>65</sup> Now, if Player A adopts a maximin strategy while Player B chooses a minimax strategy in response, then both players follow the minimax (or maximin) principle in a game.

In his book, The Analysis of International Relations, Deutsch identifies the

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<sup>63</sup> Jame D. Morrow, p. 8.

<sup>64</sup> A Pareto-optimal outcome is identified as one that in a game matrix there exists no other cell that can improve the payoff for one player without undermining it for the other player.

<sup>65</sup> Luce and Raiffa, Games and Decisions, p. 71.

minimax principle as a workable strategy for the players in a given situation in which a player assumes that his opponent will be as bright as possible and will play to win as much as he can. There often exists several strategies available to our player, by which he can hold his losses to a minimum and the winning of his opponent. Put another way, the distribution of all possible outcomes of the game for the two players must have at least one “saddle point” at which the minimum of one player’s maxima and the maximum of his opponent minima coincide which such a strategy can attain.<sup>66</sup> In short, the minimax principle means that each player should attempt to maximize the minimum gain that can be assured or to minimize the maximum loss that needs to be sustained.

Consider Matrix 5 (Figure 11). Imagine that you are Player A. What should you do?

Usually, one possible strategy is to find the highest possible payoff by picking the row in which it occurs. In Matrix 5, this is top row. On the other hand, you may choose the strategy that will guarantee a minimum payoff. If so, the second row is the safest because it guarantees a minimum payoff 2. The other possible strategy is called the maximin principle and works as follows: First, find the smallest payoff in each row; 0, 2, 0, and 1 in order from top to bottom. These numbers are called the row minima. Second, pick the largest, or maximum, of these numbers. Then, the selected number is the maximum of the minima, or “maximin.” The

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<sup>66</sup> Karl W. Deutsch, pp. 116-117.

maximin payoff in Matrix 5 is 2, in the second row, and the row is therefore called maximin strategy.

Dongherty and Pfaltzgraff propose five features of the minimax principle (1) it applies only to zero-sum games, (2) it is proof against information leakage, (3) it is useful and normative only against an opponent who is assumed to be playing a rational game, (4) the utility of the minimax strategy is validated in a series of plays, not in a one-shot game, and (5) it is a unexciting, no-fun strategy. Nevertheless, it may be advisable.<sup>67</sup>

		Player B			
		4	3	1	0
Player A	2	2	2	2	2
	3	3	3	3	0
	3	2	2	2	1

Figure 11. Matrix 5: Minimax or Maximin Principle.

#### A Zero-Sum Game: Deadlock

Unlike Prisoner's Dilemma or Chicken, Deadlock is not a specific model with

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<sup>67</sup> Dongherty, pp. 510-511.

a vivid story. For the sake of discrimination from non-zero-sum models, any zero-sum game is entitled Deadlock. That is, Deadlock can display the significant characteristics of any zero-sum game according to some fundamental assumptions. For example, Matrix 6 (Figure 12) illustrates a Deadlock game.<sup>68</sup> The numbers assigned in the cells are based on the players' preference orderings, not on how much utility. The number "1" represents the most preferred outcome. There is a dominant strategy to each player. For example, Player A's dominant strategy is the low row, defection (D) because "1" is preferred to "3" and "2" is preferred to "4". Also, there is a saddle point or equilibrium at (2, 2) because Player A nor Player B can improve his payoff by shifting his strategy.

		Player B	
		C	D
Player A	C	3      3	1      1
	D	1      4	2      2

Figure 12. Matrix 6: Deadlock Game.

Such an equilibrium in a Deadlock game is characterized as very stable. First,

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<sup>68</sup> This matrix is borrowed from Bau. Part of the following discussion also refers to Bau' analysis. See, Tzong-ho Bau, "Taipei-Peking Interaction as Two-Person Conflict: A Game-Theoretical Analysis, 1949-1988," Issues and Studies, vol. 27, no. 10 (October 1991), pp. 73-74.

neither player can force the other to accept the payoff which would be the best for one and the worst for the other. Second, the preference ordering of each player under the dominant strategy (D) is better than under the alternative strategy, cooperation (C). To be sure, constrained under the structure of the game cooperation is a less attractive and rational strategy than defection in this game.

### Non Zero-Sum Games: Prisoner's Dilemma and Chicken

#### Prisoner's Dilemma Model

Typically, the structure of the game is illustrated thus: The police arrest and placed two persons suspected of committing a crime together in separate cells. Each knows the possible consequences of his actions. There are three possible consequences for both: (1) If one suspect confesses, and his partner does not, then the confessor turns state's evidence and goes free and the other goes to jail for ten years-- a serious penalty; (2) If both suspects confess, then they both go to jail for five years; (3) If both suspects remain silent, then they both go to jail for one year for carrying concealed weapons-- a less charge. In addition, this game is based on the assumption that there is no "honor among thieves" and each suspect's sole concern is his own self-interest. Each suspect behaves as a rational actor. The game is displayed in Matrix 7 (Figure 13).

Prisoner's Dilemma proceeds by means of analyzing the point of view of one suspect. When Suspect I decides whether to confess or not, he does not have any

information regarding what his partner will do. Nevertheless, he can consider each of his partner's alternatives and anticipate the effect of each of them on himself. For example, assume his partner confesses; Suspect I must either confess and go to jail for five year, or remain silence and go to jail for ten years. On the other hand, if his partner does not confess, Suspect I can win his freedom by confessing, or go to jail for one year due to his silence.

		Suspect II	
		Confess	Do not confess
Suspect I	Confess	5, 5	0, 10
	Do not Confess	10, 0	1, 1

Figure 13. Matrix 7: Prisoner's Dilemma Model.

In either case, Suspect I has a better outcome if he confesses because confessing is a dominant strategy in this game. If so, what is the following problem?

Two naive prisoners, too ignorant to follow our inference, may both remain silent and go to jail for only one year. By contrast, two sophisticated prisoners, familiar with game theory, will confess and are sentenced to five years in prison. In other words, the paradox lies in that the suspects who adopt a dominant strategy to benefit themselves in turn suffer more than those who give up a dominant strategy and try to cooperate with each other. Then the prisoner's dilemma occurs. Snyder

extracted two relevant characteristics from the framework of Prisoner's Dilemma. That is, (1) the logic of the players' situation naturally forces them into conflict and mutual losses though they could enjoy mutual benefits by cooperation; (2) at the psychological level two kinds of incentives, the "offensive" and the "defensive" incentive would determine the players' decision on choosing strategies, either to maximize self-interests or minimize losses.<sup>69</sup> In addition, he argues that the core of the Prisoner's Dilemma lies in the inability to confirm the other player's intentions. In other words, the primary point in Prisoner's Dilemma is to determine which incentive, the offensive or the defensive, is operating most strongly in the opponent's thinking.<sup>70</sup>

In short, due to lack of trust or suspicion, it is difficult for both players as a rational actor striving for the maximum individual interests to cooperate though they know that cooperation will increase their collective benefits.

### Chicken Model

Chicken as a game-theoretical model is derived from the rather gruesome sport that apparently originated among California teenagers in the 1950s. The story is described as two teenager drivers approach each other at high speed on a narrow road. Each has the choice of either swerving and avoiding a head-on collision, or continuing on a collision course. There are four possible consequences while each

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<sup>69</sup> Glenn H. Snyder, "'Prisoner's Dilemma' and 'Chicken' model in International Politics," International Studies Quarterly, vol. 15 (March 1971), p. 67.

<sup>70</sup> Ibid., pp. 74-81.

player decides:

1. The player who does not swerve when the other does gets the highest payoff of 4 for his courage and wins the respect from his peer groups.
2. The player who “chickens out” by swerving is disgraced and receives a payoff of 2.
3. If both players lack the will to continue on the collision course to the final moment, both suffer some loss of prestige, obtaining payoff of 3, but not as much as if only one player had chosen safety instead of collision by swerving.
4. If both players refuse to cooperate, then they cause their mutual destruction, which may be fine for martyrs but not for the players in this game, who receive the lowest payoff of 1.

The structure of Chicken is displayed in Matrix 8 (Figure 14).

		Player B	
		Swerve	Do not swerve
Player A	Swerve	3, 3	2, 4
	Do not Swerve	4, 2	1, 1

Figure 14. Matrix 8: Chicken Model.

Overall, Chicken bears some resemblance to Prisoner’s Dilemma, except that the worst outcome for both players in Chicken occurs while both players “defect”

from cooperating. This is the second worst outcome to both players in Prisoner's Dilemma. The worst going to the player who defected when his opponent cooperated. Snyder notes that a rational player in Chicken is apt to choose cooperation while facing an opponent who is not expected to abandon his initial demand for cooperation. In other words, a rational player can not "protect himself" by non-cooperation for mutual non-cooperation is the worst possible outcome.<sup>71</sup> Rationality in Chicken is equivocal, what is rational depends on a player's expectations about the other's behavior not primarily on the game's payoff structure.<sup>72</sup> In Rapoport's words, in contrast to Prisoner's Dilemma in which the rational outcome is identified as the defecting one, the cooperative outcome in chicken is the natural outcome.<sup>73</sup>

Snyder has recognized a couple of essential characteristics of Chicken as follows:

1. There is a bargaining dimension; that is, there is some incrementally divisible good such that the more Player A has of it, the less Player B has of it.
2. There is a bargaining range or contract zone that includes both initial bids plus the space between them. All points in this range are preferable to no agreement for both players. DD, no agreement, sets the outer limits of the bargaining range. It is also the worst outcome for both players.

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<sup>71</sup> Ibid., p. 84.

<sup>72</sup> Ibid., p. 85.

<sup>73</sup> Anatol Rapoport, The 2X2 Game, p. 151.

3. It is possible for both players to reduce their initial bids. One way to agree is for one player to reduce his claim until it matches the initial bid of the other player (CD or DC), i.e., to back down entirely.

4. Another way to reach agreement is for both players to reduce their bids until they match (CC). In other words, cooperation (CC), which is better for both players than defection (DD) or unilateral capitulation (DC or CD).

5. It is possible to offer the opponent positive inducements (heuristically, the carrot) to yield. Such an inducement consists in increasing the opponent's capitulation payoff.

6. Increasing the cost of no agreement is also possible, that is, to threaten increased harm (heuristically, the stick). However, the stick hurts both players.<sup>74</sup>

### Contrasts Between Prisoner's Dilemma and Chicken

Compared to the essential feature of Chicken, a contest in which each player is trying to prevail over the other, the major theme of Prisoner's Dilemma, in Snyder's words, is that of the frustration of the mutual desire to cooperation. In both models, perceptions of the other player's intentions are significant. The players ways face a problem of establishing the credibility of their stated intentions. For example, in Prisoner's Dilemma, establishing credibility means instilling trust. Whereas in

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<sup>74</sup> Glenn H. Snyder and Paul Diesing, pp. 107-108.

Chicken, it involves creating fear.<sup>75</sup> In other words, what a rational player worries during a Prisoner's Dilemma game is the "dilemma" whether he should trust his opponent before his decision to cooperate for the sake of increasing self-interests. However, in a Chicken game, he will consider whether his opponent would play tough, and when he should give in if the outcome would damage his safety (or vital interests). In addition, the cooperative outcomes either in Prisoner's Dilemma or in Chicken, is not equilibrium.

To achieve cooperation, both players must "resist the temptation" to shift away from the cooperative outcome in pursuit of the largest interest. Each must trust the other not to give in. The game differs in that in Prisoner's Dilemma, if one player defects, the other gains by retaliating and defecting in turn. Whereas, in Chicken, retaliation is more costly than capitulation. More important, in Prisoner's Dilemma there is no competitive pressure on the natural outcomes as there is in Chicken. On these bases, Rapoport argues that the natural outcome, i.e., DD, would be more stable in Prisoner's Dilemma. The natural outcome in Prisoner's Dilemma is regarded as Pareto-deficient<sup>76</sup>; by contrast, it is Pareto-optimal in Chicken. On this basis, one might expect the natural outcome, CC, to be more stable in Chicken.

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<sup>75</sup> Ibid., p. 84.

<sup>76</sup> A Pareto-deficient outcome is viewed as a determined result derived from the combination of the players' defecting strategies, especially in a Prisoner's Dilemma game. In most cases, according to Rapoport, a Pareto-deficient outcome seems inevitable because defection is a relatively dominant strategy in contrast to cooperation and the players are tending to maximize their minimum payoff.

## Suggested Solutions to Game-Theoretical Models

According to von Neumann, a solution means “a set of rules for each participant which tell him how to behave in every situation which may conceivably arise.”<sup>77</sup> Solutions to a Deadlock game is easily found if a dominant strategy might result in a saddle point or an equilibrium for one player or both. That is, according to the logic of rational choice, each player is expected to adopt a dominant strategy, if any, or stick to a saddle point. Then, the game would be solved in a determined way. However, to those games without a relatively dominant strategy or an equilibrium, studying the styles and attitudes of the players’ responses in decision-making processes is interesting for us, i.e., in a game.

For example, how could we solve any non-zero-sum game in which the players are not totally against each other in interests. For example, if there is common interest between both and if both players cooperate they could increase their own private expected outcomes? Imagine you are Suspect I in Prisoner’s Dilemma, what should you do? To be sure, there is no way out of Prisoner’s Dilemma if they play the game just once. Choosing is rational for both suspects “confess” because they are afraid of being double-crossed. Then, (5, 5) will be assigned to both suspects as a determined payoff. By contrast, if they can play the game often, i.e., both players do not have any idea when the game will end, choosing cooperative strategy to increase

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<sup>77</sup> Von Neumann, p. 31.

payoffs might be possible for both players. According to his experimental results, Rapoport points out that the players in two-by-two non-zero-sum iterated games like Prisoner's Dilemma or Chicken stick to the preceding response, especially CC and DD.<sup>78</sup> That is, due to "locked in" the preceding experience of conflict management, the players are learning to cooperate.

### "Tit for Tat" Strategy

To the conflict situation we mention above, "tit for tat" may be applied as a particle strategy in which we can explain why the cooperation is viewed as a rational choice. Axelrod defines "tit for tat" as a strategy with which the players choose cooperation first and then choose whatever strategy the opponent chooses.<sup>79</sup> We can represent the "tit for tat" strategy in the following Figure 15.

	Strategies available (Defection or Cooperation)						
No. of Play	1	2	3	4	5	6	...
Player A	C	C	C	D	D	(C)	...
Player B	C	C	D	D	D	(C/D)	...

Figure 15. Tit for Tat Strategy.

<sup>78</sup> Anatol Rapoport, Formal Games as Probing Tools for Investigating Behavior, pp. 576-577.

<sup>79</sup> Robert Axelrod, "More Effective Choice in the Prisoner's Dilemma," Journal of Conflict Resolution, vol. 24, no. 3 (September 1980): 380.

According to the assumption of “tit for tat,” in the first round Player A will adopt cooperation when he competes with Player B in an iterated game. To Player B, he can respond with either cooperation or defection. If he also cooperates, as we assume, then Player A will stick to the cooperation strategy.

This cooperative relations between both players will last until one side begins to defect (it usually happens on Player B because Player A adopts a “tit for tat” strategy.) Up to the third round, Player B obviously violates a binding agreement and shifts his strategy from cooperation to defection, which indeed affects on Player A’s following reaction. Facing Player B’s defection, Player A can not help turning to defection in order to eliminate the likely loss due to double cross. Besides, there is a “locked-in” phenomenon easily identified in the preceding figure, for example, the interaction between both players in the first three rounds or from the third round to the fifth round. The “locked-in” phenomenon, either continuous cooperation or defection, naturally exists in a game when one or both players choose “tit for tat” as a strategy.<sup>80</sup>

It may happen that Player A ( or Player B) would change his mind to cooperate again ( like in the sixth round) to increase unilateral payoffs guaranteed by mutual cooperation. However, this transformation in strategies, especially under the defection locked-in situation, is uncertain because the players have to take a risk of being double-crossed and believe the other players sharing the similar spirit to do so.

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<sup>80</sup> More discussion, see Henry Hamburger, pp. 232-236.

Matrix 9 (Figure 16) indicates the application of “tit for tat” to a Prisoner’s Dilemma game.

Suppose Suspect I wants to adopt “tit for tat” as a strategy. At the first step, Player A chooses the low row (does not confess, i.e., cooperation) and waits for Player B’s response. There are two alternatives open to Player B, either the right column (cooperation) or the left column (defection).

		Suspect II		
		Confess	Do not confess	Tit for Tat
Suspect I	Confess	5, 5	0, 10	5, 5
	Do not Confess	10, 0	1, 1	1, 1
	Tit for Tat	5, 5	1, 1	1, 1

Figure 16. Matrix 9: The Application of “Tit for Tat” Strategy.

If Player B adopts defection, then Player A would choose defection in response to Player B’s decision (according the logic of “tit for tat”). If so, the payoff pair for “tit for tat” is (5, 5) located at the rightist column. By contrast, if Player B adopts cooperation, then Player A would stick to a cooperative strategy. Under such a situation, the payoff pair for “tit for tat” is (1, 1) located at the central column. Obviously, “tit for tat” could benefit both players in an iterated game because (1, 1) is

much more preferred than (5, 5).

### Mixed Strategies

Like “tit for tat”, mixed strategies may be applied as an efficient method to pursue a solution. Suppose a player uses some random device to decide which choice he will make. Since there are two choices (assume a game under the framework of two-by-two), the random device should yield one of two outcomes. By fixing the probabilities of these outcomes, the player in effect in effect choose a mixed strategy. In other words, a mixed strategy can be regarded as a statement about “how many times on average a pure strategy is used.”<sup>81</sup>

Consider Matrix 10 (Figure 17)<sup>82</sup>. Assume that Player A may switch back and forth without following a pattern, i.e., by choosing randomly. Then, Player B can not possibly discern a pattern because there is none to be discerned. Suppose Player A flips a true coin (as a random device) each time to determine his choice. Then, whenever Player B picks, say, the left column, the payoff to Player A is equally likely to be 5 or -4, i.e., both payoffs have a fixed probability 1/2. The expectation of the payoff, or simply expected payoff (expectation is defined as a weighted average of outcomes where the weights are probabilities <sup>83</sup>), is found as  $1/2 (5) + 1/2 (-4) = 1/2$ .

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<sup>81</sup> Ken Binmore, Essays on the Foundations of Game Theory, p. 65.

<sup>82</sup> This matrix is borrowed from Henry Hamburger. Part of the following discussion and demonstration refers to Hamburger’s analysis. See Henry Hamburger, pp. 47-56.

<sup>83</sup> Henry Hamburger, p. 39.

Whenever Player B picks the right column, the payoff to Player A is equally likely to be 3 or 0 (each payoff has probability  $1/2$ ), so in the case Player A's expected payoff on average is :  $1/2 (3) + 1/2 (0) = 3/2$ .

		Player B	
Player A		5	0
		-4	3

Figure 17. Matrix 10: The Application of Mixed Strategies (1).

In other words, if Player A chooses a mixed strategy, say, half the top row and half the low row, then he can get the minimum expected payoff  $1/2$ . To be sure, Player A can do better in this game if he decides to pick the top row with probability  $7/12$ . Then, when Player B uses the left column the expected payoff to Player A is:  $(7/12) (5) + (5/12) (-4) = 5/4$  and when Player B uses the right column, the expected payoff is:  $(7/12) (0) + (5/12) (3) = 5/4$ . In other words, in this way Player A can arrange to have an expected payoff of  $5/4$  no matter what Player B may do. Notice that the maximin mixed strategy means the maximin among all strategies. To learn the maximin mixed strategy for Player A in Matrix 10, we examine the effects of various mixed strategies that Player A might adopt. In addition, a few mixed strategies shown in Matrix 11 (Figure 18), which includes the pure strategies of

Matrix 10 as its first two rows. However, in the new, extensive matrix the last row has the largest minimum, and therefore  $(7/12, 5/12)$  is the maximin among the mixed strategies.

More important, no matter what other mixed strategies are considered,  $5/4$  is the best that Player A can guarantee himself under the probability pair  $(7/12, 5/12)$ . Can we prove it? Suppose the probability of the top row is increased beyond  $7/12$ , say to  $7/12 + "C"$  (" $C$ " represents a very small positive amount), then Player B can use the right column to make the payoff as follows:  $(7/12 + C)(0) + (5/12 - C)(3) = 5/4 - 3C$  [A], or Player B can choose the left column as the response, if so, the payoff will be:  $(7/12 + C)(5) + (5/12 - C)(-4) = 5/4 + 9C$  [B]. Obviously, since the payoff [A] is less than  $5/4$ , it is irrational for Player A to change the original mixed strategy.

		Minimum in row		
Probability Pairs		5	0	0
		-4	3	-4
	(1/2, 1/2)	1/2	3/2	1/2
	(1/3, 2/3)	-1	2	-1
	(7/12, 5/12)	5/4	5/4	5/4

Figure 18. Matrix 11: The Application of Mixed Strategies (2).

Also, since the payoff [B] is more than  $5/4$ , it is irrational for Player B to respond with the left column. Put another way, suppose the probability of the top row is decreased by a small amount "C" to make it  $7/12 - C$ , then Player B can pick the left column and the payoff will be:  $(7/12 - C)(5) + (5/12 + C)(-4) = 5/4 - 9C$  [C], or Player B can choose the right column, if so, the payoff will be:  $(7/12 - C)(0) + (5/12 + C)(3) = 5/4 + 3C$  [D]. To Player A, he can not get more payoff when he transforms the probability pair. By contrast, to Player B, it is a wise move to pick the left column when Player A's mixed strategy is informed.

In short, player A can be forced to settle for less than  $5/4$  if he deviates from  $(7/12, 5/12)$ .

#### Other Principles for Solution

In his article, "Explaining Cooperation under Anarchy," Oye describes how payoffs affect the prospects for cooperation and present strategies to improve the prospects for cooperation by altering the structure of payoffs. He notes that the recognition of mutual benefits is necessary to promote cooperation because the game (any non-zero-sum game) would follow the following hypothesis: The more substantial the gains from cooperation and the less substantial the gains from unilateral defection, the greater the likelihood of cooperation.<sup>84</sup> Deutsch also points

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<sup>84</sup> Kenneth A. Oye, "Explaining Cooperation Under Anarchy: Hypothesis and Strategies," World Politics, vol. 38 (October 1985), pp. 6-9.

out a couple of relevant conditions for a successful cooperation. He states that the cooperation strategy may succeed if it results from a given situation in which one of players (or both players together) (a) initiates cooperation (e.g., adopt “tit for tat”); (b) persists in making cooperative moves since they are reciprocated; and (c) retaliates with fail whenever repeated or frequent defection is encountered, but (d) renews from time to time thereafter a sequence of two or three unilateral cooperative moves to give the opponent a chance to shift to a sequence of mutual cooperation.<sup>85</sup>

During his study of Cyprus conflict under the framework of Prisoner’s Dilemma, Lumsden argues that it may work to solve Prisoner’s Dilemma by either decreasing the value of the defecting outcome (DD), to the extent that it becomes the lowest payoff (i.e., converting Prisoner’s Dilemma into Chicken), or increasing the value of cooperation.<sup>86</sup> According to our preceding description concerning the characteristics of Chicken, the rational players naturally adopt cooperation in Chicken because a living chicken is better than a dead hero. To be sure, solving a Chicken game and a Prisoner’s Dilemma game is easier if we can raise the cost of conflicts although the defecting payoff is already the worst among other outcomes. In short, either in Prisoner’s Dilemma or Chicken, Jervis suggests that the possibility of cooperation would be enhanced if (a) the payoffs of both players increase under

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<sup>85</sup> Karl W. Deutsch, The Analysis of International Relations ( Englewood Cliffs, New Jersey: Prentice-Hall Press, 1968), p. 122.

<sup>86</sup> Lumsden, pp. 16-17.

cooperation; (b) the costs of mutual confrontation increase; (c) the gains from shifting away from a cooperative strategy and double-crossing one's opponent decrease; (d) the cost of being double-crossed decreases; and (e) the expectations of both players that cooperation will be achieved increase.<sup>87</sup>

## Conclusion

In the very beginning of this chapter, we describe the concept of equilibrium, or other similar ideas like Nash equilibrium, saddle points, and the minimax principle, that allows us to highlight some general characteristics related to game models. Besides, these ideas can contribute to our primitive understanding of solutions for game-theoretical models. By game models, we have distinguished zero-sum games from non zero-sum games. From the perspective of zero-sum games, we conclude that the result is determined because the players by nature will choose their own dominant strategy which guarantees the second best payoffs for the players. Deadlock can adequately display how the players behave rationally in the game in which their interests are in total conflict. In non zero-sum games, there exist mutual interests, inciting the players to cooperate with one another for the sake of elevating self-interests. Two well-known models, Prisoner's Dilemma and Chicken, identified as stereotypes for non zero-sum games, are discussed. Not only do we point out the significant features of each game model, but we also make a comparison between

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<sup>87</sup> Rober Jervis, "Cooperation under the Security Dilemma," World Politics, vol. 30 (1978): 171.

### Prisoner's Dilemma and Chicken.

According to Snyder, the "dilemma" of a rational actor in a Prisoner's Dilemma game is whether he should trust his opponent before he decides to cooperate for the sake of increasing personal payoffs. By contrast, if he engages in a Chicken game, he will place priority in considering whether his opponent will play tough, and when he should give in if the expected outcome would damage his safety or vital interests. Through comparison, we draw a conclusion that cooperation as a Pareto-optimal outcome in Chicken is more stable than that in Prisoner's Dilemma.

As to solutions to game-theoretical models, there are two major formula mentioned in this chapter: the "tit for tat" strategy and mixed strategies. Axelrod defines "tit for tat" as the strategy in which the players choose cooperation first and then adopt whatever strategy the opponent responds to. He argues that the players can agree if they adopt "tit for tat" strategy simultaneously. A mixed strategy is viewed as a statement about "how many times on average a pure strategy is used." By a mixed strategy, Binmore notes that the players can seek the maximal expected payoffs in the game. Other suggested solutions like Jervis', stressing on the reorganization of the payoff structure, may also shed a light to address the question: How to solve a game?

## CHAPTER IV

### APPLICATIONS OF GAME-THEORETICAL MODELS TO INTERNATIONAL CONFLICTS

#### Introduction

Game theory is based on at least two fundamental assumptions: (1) a rational actor will behave in accordance with his preference ordering; and (2) a rational actor will adopt defecting or cooperative strategies in pursuit of his maximum interests. Structuring a game is easier, either zero-sum or non-zero-sum, by identifying the major conflicts among the players. Two-by-two game-theoretical models are useful in dealing with an interest-conflict situation between the rational players, although the game models are criticized as too simple to describe and fit the complications of reality within the structure of the game. Another general criticism regarding two-by-two models is that the models ignore the role of a third party and the possibility for a third option in a given game.

Should we expect to extend the application of the scope of game-theoretical models further and apply them to explaining international conflicts among nations when we acknowledge there are a couple of limitations or weaknesses embedded in game models? First, we should take a close look at the following problems initiated by critics of game theory. They argue that most international conflicts do not have a

clearly defined two-by-two structure. That is, there may be more than two nations involved in a specific international conflict. Each nation as a rational actor may have more than two alternatives to cope with a given crisis. In practice, the preference ordering of a nation is more complicated, and thus difficult to identify. The essential problem facing most game-theorists is that of “selecting the appropriate criteria to choose the better game (model) to explain a situation.”<sup>88</sup>

Does it make any sense for game theorists to choose two-by-two models instead of  $n \times m$  models? Put this way, can we solve the preceding problems with respect to the applications of game models to international stalemates? In theory, the choice set, the rows and columns of a matrix, may consist of diverse levels of cooperation/defection, i.e., there may be more than two options in a game. However, for the sake of building concise models, game theorists tend to set the number of  $n$  equal to 2 because they use cooperation/defection as categories for classifying likely strategies for the players. In doing so, they can identify and analyze “the basic structure of the crisis situation” in which the strategy interactions are dramatically reduced and easily focused. Take, for example, the U.S. options in the Cuban missile crisis of 1962. From “do nothing” to the naval blockade, bombing of the missile sites, and the invasion of Cuba, reactions and interactions can be contained within a two-

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<sup>88</sup> Christian Schmidt and Pierre Allan, “Introduction,” Game Theory and International Relations: Preferences, Information and Empirical Evidence, Pierre Allan and Christian Schmidt, eds. (Aldershot, Hants, England: Brookfield, Vt., USA: Edward Elgar, 1994), p. 2.

poles continuous scale, i.e., they would be located somewhere between cooperation and defection.

As for the number of players in an international conflict, according to the logic of game models, the nations are identified as players because there are obviously conflicting and/or mutual interests among them in a given situation. Using the Berlin crisis (1958-60) as an example, the major players in this crisis are the U.S. and the U.S.S.R. because both nations disagreed with the settlement of West Berlin. Although on the surface that they agreed the Germans should reunify Germany someday somehow. How do game theorists (or strategy analysts) deal with the influence and attitude exerted by German Democratic Republic (East Germany) and the Federal Republic (West Germany)? In practice, due to sharing the similar interests, they viewed East Germany as a game partner with the Soviet Unions. In contrast, West Germany stands on the U.S. side during the crisis.

Other reasons for the infrequent applications of the N-person model to conflict situations include:

1. Researchers have to recognize a major player as a leader eager to form a coalition among players. Before that, researchers should address the following question: What would be the criterion for selecting a leader among players?
2. Researchers are supposed to find a "decision point"--a point in time when they set binding agreement are awarded and distributed among its members (players). Obviously, N-person theory is vague about the location of this point (or

equilibrium).<sup>89</sup>

It will be a significant problem to choose a adequate model to describe and explain a specific conflict situation. In this study, to solve the problem of selecting models, using two principles, the players' subjective recognition and the objective constraint of the conflict situation when we assign a game-theoretical model to a given situation. For example, we may identify a conflict situation which fits the Prisoner's Dilemma while we observe there exists a combination of interest and conflict between the players, and that both players with similar strength and resource can simultaneously discover and adopt a dominant strategy to play. Moreover, the players in a Prisoner's Dilemma game are not afraid to defect with one another, i.e., they prefer to bear the cost of mutual defection rather than be double-crossed by the others. By contrast, we will recognize the situation as Chicken if one of the players shifts away from Prisoner's Dilemma, i.e., compared to other players, he plays Chicken due to fear ( e.g., the concern for security), lack of sufficient resources (e.g., the loss of outside help), or other considerations.

McClelland identifies five approaches (or aspects) to deal within analyzing a specific international conflict : (1) definition of crisis; (2) classification of types of crisis; (3) the study of ends, goals, and objectives in crises; (4) decision-making under conditions of crisis stress; and (5) crisis management.<sup>90</sup> In according with the

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<sup>89</sup> Glenn H. Snyder and Paul Diesing, pp. 65-66.

<sup>90</sup> Charles A. McClelland, "Crisis and Threat in the International Setting: Some Relational Concepts," unpublished memo cited in Michael Brencher, "Toward a

characteristics or functions of game-theoretical models, we can say that each model completely meets the profile for the study of international conflicts. That is, through the structure of the game, either game tree or matrix, a specific crisis can be represented; the types of conflicts can be determined; the goals or motives of the players can be displayed; the alternatives for the players can be assigned; and the players' choices can be predicted. Put another way, game-theoretical models can reflect the reality of a interest-conflict situation to the extent that we can easily realize the basic structure of the crisis situation. Lumsden notes that Prisoner's Dilemma as a model of dealing with international conflict displays a couple of significant features: (a) neither player assumes war as the worse of all possible outcomes; (b) each player assumes the other player's most desired outcome as his own worst outcomes; (c) each player assumes peace much more positively than war; (d) neither player assumes peace more positively than his own initial goal.<sup>91</sup>

As for the relation between a model and reality, Meehan has identified the following useful guidelines:

If a model is used as an aid to explanation, then the interaction of elements in the system is prime; if the model is used for prediction, the outcome of dynamic processed in model and empirical world must be similar. . . . Models are always partial and approximate, as are analogies. It follows that there will be properties of observed reality not

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Theory of International Crisis Behavior," International Studies Quarterly, vol. 21 (March 1977), pp. 39-40.

<sup>91</sup> Lumsden, p. 14.

duplicated in the model, at least potentially, and it is always possible that models have properties that are not duplicated in the empirical world. Furthermore, models and analogies may be useful in creating some expectations with regard to reality but may be quite useless and even misleading in other respects.<sup>92</sup>

Before introducing of the cases in this study, two points as to the structure of the game should be noted. First, we view each international crisis as a continuous event that could fit into a repeated game-theoretical model. Next, the payoffs we assign to each player are aggregate. They are accumulated from the first round to the final one. Representing payoffs with numeral units is not necessary always. It may be enough to expose each player's preference ordering by means of a game matrix because a rational player could/would adopt an adequate strategy according to the pattern of his preference ordering.

### Deadlock: The Southwest Pacific Conflict

#### The Background of the Conflict

In February 1943, General George Churchill Kenney, Commander of the Allied Air Forces in the Southwest Pacific, was responsible for military decisions. In the critical stages of the struggle for New Guinea, intelligence reports showed that the Japanese were about to strengthen their army in New Guinea by moving a troop from

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<sup>92</sup> Eugene J. Meehan, Contemporary Political Thought: A Critical Study (Homewood, Illinois: Dorsey, 1967), pp. 31-32.

the port of Rabaul at the eastern tip of New Britain to Lae in and they had a choice of two alternative routes. They could sail either north of New Britain, where the weather was rainy and poor visibility was certain, or south of New Britain, where they expected that the weather was fair. Regardless, the journey would take three days. General Kenney had to decide as which route to concentrate the bulk of his reconnaissance aircraft. On either route the American army could bomb the Japanese ships. By contrast, the Japanese obviously wanted their ships to have the least possible exposure to enemy bombers.<sup>93</sup>

#### The Likely Payoffs of the Game

The structure of the game is represented in Matrix 12 (Figure 19).

		Japanese Strategies	
		North Route	South Route
Kenney's Strategies	North Route	2	2
	South Route	1	3

Figure 19. Matrix 12: The Southern Pacific Conflict.

The number assigned into the cells shows the expectation of bombing day.

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<sup>93</sup> This situation was taken from an article by O. G. Haywood, Jr., entitled "Military Decisions and Game Theory."

There exists no mutual interest. To Kenney, the higher the number the better; but the Japanese wanted the opposite. To the Japanese commander, the payoffs (the right column and the left column) were obviously the same-- sail the north or the south route.

### The Players' Preference Orderings and Strategies

Since being exposed to few days of American attack is better for the Japanese army, we can display the preference ordering for the Japan as (1, 2, 3).

Compared to the north route strategy, the south route strategy was a relatively dominant strategy because it may avoid the additional damage to the army due to the caprice weather. In such inference, choosing the south route strategy is wise for the Japanese commander. By contrast, the preference ordering for the U.S. was (3, 2, 1). Kenney chose to take a risk though he could expect the Japanese decision according to estimating and analyzing the structure of the game.

### The Solution of the Game

The game ended with the fact that the Japanese chose the south route strategy and suffered severe losses. However, Haywood argues that "although the Battle of the Bismark Sea ended in a disastrous defeat for the Japanese, we cannot say the Japanese commander erred in his decision."<sup>94</sup> That is, as we mention above, his choice, either

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<sup>94</sup> O. G. Haywood, Jr., "Military decision and game theory," Journal of the Operations Research Society of America, vol. 2, 1954, p. 369.

the north route strategy or the south route strategy, was good against either of Kenney's strategies.

### Prisoner's Dilemma: The Berlin Crisis (1958-1960)

#### The Background of the Conflict

In a Note to the Western Powers and the Federal German Government on November 27, 1958, Khrushchev unilaterally abrogated the Potsdam agreements of 1945. Those agreements stipulated that Germany would be restored as a single nation following democratic principles under the supervision of the Four Powers on Occupation. Also, he required the withdrawal of all Western forces from Berlin and the abolition of all ties existing between Berlin and the Federal Republic in six months. If the Western Powers refused to negotiate a peace treaty, the Soviet Union would unilaterally make a peace treaty with East Germany (the Soviet puppet regime) and turn over control of the access routes to West Berlin to the East German government.

#### The Likely Payoffs of the Game

According to Snyder's model, the structure of the game could be created as Matrix 13 (Figure 20, under the framework of Prisoner's Dilemma).<sup>95</sup>

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<sup>95</sup> Snyder's model (Figure 2-27. West Berlin, 1958), see Glenn H. Snyder and Paul Diesing, Conflict Among Nations: Bargaining, Decision Making, and System Structure in International Crises (Princeton, New Jersey: Princeton University Press, 1977), p. 92.

		United States	
		Concede	Firm
Soviet Union	Concede (Cooperate)	<p>2</p> <p>Status quo, stabilized by compromise settlement of minor disputes concerning West Berlin and access to it.</p> <p>Compromise peace settle in Germany some modification of status of West Berlin.</p>	<p>4</p> <p>Self-assertion against Soviet Union; stabilization of status quo.</p> <p>Humiliation; demoralization of the G.D.R.; political trouble in East Europe.</p> <p>1</p>
	Firm (Defect)	<p>1</p> <p>US humiliation; demoralization of West Berlin and West Germany; loss of hope of reunification of Germany</p> <p>Peace settlement in Germany; stabilized status quo with Western Powers out of West Berlin.</p> <p>4</p>	<p>3</p> <p>Soviet Union peace treaty with G.D.R.; probable East Germany lock-ade of access routes possible</p> <p>Soviet Union local or peace treaty with general G.D.R. Limited fighting, war. cease-fire, negotiations.</p> <p>3</p>

Figure 20. Matrix 13: The Berlin Crisis (1958-1960).

#### The Players' Preference Orderings and Strategies

The intention of Khrushchev's action could be uncover by means of the analysis of the contents of Soviet proposal for peace settlement in Germany on May 15, 1959 in which three major points were exposed:

1. The basic Soviet contention that their occupation zone be regarded as an equal of the Federal Republic with no mention made of free elections and with no time limit on the negotiations to be conducted only by the two opposing German camps. Since East Germany is a puppet of the Soviet regime, this made the Soviet Government practically the sole negotiator with the Federal Republic, with the Western Powers completely excluded.

2. The second point of the Soviet plan involved ending the occupation of Berlin by the Western Powers altogether, under the formula of establishing Berlin as a “free, demilitarized city.” Since West Berlin was, after all, free to begin with, the key word “demilitarization” obviously meant no more than the evacuation of the city by the Western Powers, leaving it defenseless and completely surrounded by Soviet-controlled territory.

3. The third point called for the withdrawal of the NATO powers from all “foreign territory” and the dismantling of all military bases.<sup>96</sup>

In other words, the best payoff for the Soviet Union would be to reach peace settlement in Germany and isolate West Berlin from the Western Powers. An additional benefit would be that the reputation of the West Community in the German’ mind and the NATO powers in the European continent would be undermined. The second best result would be to comprise peace settlement under

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<sup>96</sup> Berlin: Crisis and Challenge (New York: German Information Center Press, ), pp. 24-25.

certain conditions (e.g., trade some modification of status of West Berlin for the international identification of East Germany). By contrast, the second worst payoff would be to unilaterally sign peace treaty with East Germany regime. The worst result would be to invite humiliation and to lose political reputation in East Europe.

According to Snyder's analysis, from the Soviet Union position Khrushchev hoped the United States to concede (DC), and to succumb under the Soviet's threat and excuse of establishing a free city. By submitting the proposal and expressing willing to negotiate on a peaceful settlement, the Soviet Union was eager to search for a compromise acceptable to both sides (CC). The Soviet Union could achieve certain interests from a cooperative consequence. They could confirm their aggression strategy in Europe, strive for international identification for East Germany, and clarify the United States' standpoint on German problem. Under Prisoner's Dilemma, the Soviet Union did not avoid the possibility that the game came to a deadlock (DD). Khrushchev estimated that if so, "there would be some brief but intense tank and air battles, a cease-fire, and then negotiation on the CC pattern". As to the worse outcome (CD), the Soviet Union was forced to endure the West German "revenge-seekers" who used West Berlin to stir up trouble in the Socialist camp and weaken the stability and security of East German regime.<sup>97</sup>

To the United States, the preference ordering would be consisted of four likely outcomes: (1) the best payoff would be maintain the status of West Berlin and to

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<sup>97</sup> Glenn H. Snyder and Paul Diesing, p. 93.

resist Soviet's threats; (2) the second best result would be to concede to some Soviet's requests for peaceful settlement ; (3) the second worst payoff would be to confront the likelihood of East Germany's blockade and harassment to West Berlin; and (4) the worst result would be to invite humiliation and to decline the influence of Western Powers in East Europe. Since they aimed the Soviet action or proposal at humiliating the West that, if allowed to succeed, would undermine the reputation of the West Community, damage vital interests, and what is more important, perhaps leads to the eventual collapse of NATO. In contrast to the consequence of conceding (DC), the payoff of DD was much more acceptable and tolerable. That is, the United States in practice stood firm though it would run a risk of war that might arise from East German harassment or blockade of the access routes. Besides, the United States assumed that the Soviet Union was playing Chicken and behaved as if it were a bluff, which convinced it to play hard. Like the United States, the Soviet Union as a rational actor, under the limitations of Prisoner's Dilemma framework, to maximize individual interests or corroborate the minimum benefit would like to confirm its attempt to humiliate the United States at the expense of partial intense conflict rather than accept a sucker's payoff. It seems that DD would be the only one rational solution to both sides.

### The Solution of the Game

Due to both players' adoption of a dominant strategy and because of the limited cost of local military conflict, the conflict situation (DD) lasted until the end

of 1960. Not until 1961 did Khrushchev suggest friendliness to Kennedy administration and end the second Berlin Crisis.

### Chicken: Cuban Missile Crisis (1962)

#### The Background of the Conflict

In late July 1962, the Soviet Union began shipping weapons and military personnel to Cuba. The Soviet government explained that the arms sent to Cuba would enable Fidel Castro to defend his regime against future American attacks. Not until by October 15 had CIA photographic analysts studied the U-2 pictures and announced that the Soviet Union was building launching sites for both 1,000-mile medium-range missiles (MRBM) and 2,200-mile intermediate-range missiles (IRBM). A simple choice by Khrushchev initiated the crisis to place missiles in Cuba.

#### The Likely Payoffs of the Game

The structure of the game can be represented as Matrix 14 (Figure 21, the likely payoffs for both players are assigned within each cell)<sup>98</sup>.

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<sup>98</sup> Relevant discussion, see Steven J. Brams, Game Theory and Politics (New York: The Free Press, 1975), pp. 39-47; Negotiation Games: Applying Game Theory to Bargaining and Arbitration (New York: Routledge Press, 1990), pp. 104-116.

		United States	
		Cooperate	Defect
Soviet Union	Cooperate	<p>2</p> <p>Mutual removals of missiles of other trades.</p>	<p>3</p> <p>Removal of missiles; protection of resolve reputation and position in nuclear balance.</p> <p>Humiliation; Undermined international prestige. Cuba remains vulnerable.</p> <p>1</p>
	Defect	<p>1</p> <p>Humiliation; Loss of position in nuclear balance and balance of resolve.</p> <p>Improved position in nuclear balance; self-assertion against the United States; protection of Cuba.</p> <p>3</p>	<p>4</p> <p>Various levels of possible war, including possible escalation to nuclear.</p> <p>4</p>

Figure 21. Matrix 14: Cuban Missile Crisis (1962).

#### The Players' Preference Orderings and Strategies

To the U.S. the removal of missiles at the lowest cost would be the optimal payoff in this crisis. The second best result would be to get the missile removed at the

expanse of other trades. The second worst payoff would be to invite humiliation and allow the Soviet Union to upgrade nuclear power. The worst result would be to risk initiating various levels of war, including nuclear war. To achieve the best outcome and eschew a likely catastrophe, Kennedy had to decide among three possible reactions: (1) accept the Soviet missiles in Cuba; (2) attempt to remove them by military force; or (3) attempt to induce Khrushchev to remove them.<sup>99</sup>

In fact, we could view the last two choices with the same purpose, i.e., to remove missiles from Cuba. Adopting the first choice was impossible for Kennedy because “if Khrushchev could place missiles this close to the United States and get away with it, the United States would look like a paper tiger.”<sup>100</sup> In practice, Kennedy went with the third choice. He decided to blockade with a threat to launch a military attack. Kennedy and his advisers were very concerned about the possibility that an American attack on Cuba might be followed by a Soviet attack on Berlin, or on American missile sites in Turkey. In other words, the United States chose to play tough and estimated the conflict would be treated as a Prisoner’s Dilemma game, i.e., the Soviet Union may adopt a defecting strategy, then partial war or other disastrous consequence was inevitable. Betts argues that the blockade in the Cuban missile crisis was regarded as “threats that leave something to chance.” That is, the action

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<sup>99</sup> Models of Strategic Choice in Politics, Peter C. Ordeshook ed. (Ann Arbor: The University of Michigan Press, 1989), p. 179.

<sup>100</sup> Glenn H. Snyder and Paul Diesing, p. 115.

represented either a commitment to the United States or the risks that it entailed led to pressure on the Soviet Union to capitulate.<sup>101</sup> Also, Allison calls the blockade decision “part choice and part result--a melange of misconception, miscommunication, misinformation, bargaining, pulling, hauling, and sparring, as well as a mixture of national security interests, objectives, and government calculation.”<sup>102</sup>

The Soviet Union’s preference ordering could be specified as follows:

1. The best payoff would be to improve its position in the nuclear balance and at the same time to protect Cuba from the American invasion in the future.
2. The second best result would be to compromise to remove the missiles in trade of something (e.g., the removal of the United States missiles in Turkey).
3. The second worst payoff would be to invite humiliation and to leave Cuba vulnerable.
4. The worst result would be to face the likely war with the United States, including nuclear war.

To seek the best outcome or to attempt to avoid the grand cost of war, what was Khrushchev’s response to Kennedy’s threat ? Khrushchev’s actual response was to behave as if he planned to challenge the naval blockade, while simultaneously accelerating construction of the missile sites. In other words, Khrushchev implied to

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<sup>101</sup> R. K. Betts, Nuclear Blackmail and Nuclear Balance (Washington DC: The Brookings Institution, 1987), pp. 10-16.

<sup>102</sup> Graham T. Allison, Essence of Decision: Explaining the Cuban Missile Crisis (Boston: Little, Brown, 1971), p. 210.

play firmly. If so, it is well known that we would identify the crisis as a Prisoner's Dilemma game. However, during the American blockade, through the secret communication with the White house, suddenly Khrushchev agreed to remove the missiles out of Cuba while the American government promised that the American army would not attack Cuba.

To most Soviet affairs specialists, their attention may be placed on the puzzling questions raised by Khrushchev's behavior: Why did Khrushchev deploy strategic weapons in Cuba? What led him to believe he could succeed? Or Why did he withdraw the weapons so precipitately?

According to his analysis, Allison notes that the Soviet Union placed missiles in Cuba not only as a bargaining counter for the withdrawal of the United States missiles in Turkey, nor to attract a US move against Cuba to cover a Soviet move against Berlin, nor to deter an US attack against Cuba to display moves against an indecisive United States, but rather to cause quickly and at low cost a rectification of the adverse nuclear missile balance by converting Cuba into an "unsinkable carrier" and doubling the Soviet capability for a first strike against the United States.<sup>103</sup> Brams recognized the Cuban missile crisis as a Chicken game because "neither side (especially the Soviet Union) was eager to take any irreversible steps, such as the teenage driver in a game of Chicken might do by defiantly ripping off his steering

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<sup>103</sup> Graham T. Allison, pp. 40-56.

wheel in full view of his adversary, thus force losing his alternative of swerving.”<sup>104</sup>

Obviously Khrushchev played Chicken during the crisis though at the very beginning of the crisis he pretended to play Prisoner’s Dilemma by means of implying retaliation if the United States attacked Cuba.

To be sure, the blockade alone did not lead to the withdrawal of Soviet missiles from Cuba. Giving a United States assurance against an invasion of Cuba combined with a threat of “overwhelming retaliatory action” unless Kennedy received immediate notice that the missiles would be withdrawn.<sup>105</sup>

### The Solution of the Game

Since the crisis was identified as a Chicken game, the worst outcome of defection (DD) could be avoided because the Soviet Union tended to play Chicken instead of Prisoner’s Dilemma. Then, the payoff for the action of the United States could be either mutual removal of missiles by trading Turkey missile sites for Cuba missiles or protection of reputation or position in unclear balance. Since the United States played firmly with Prisoner’s Dilemma, the natural outcome for the United States would be not only the removal of Cuba missiles, but also confirmed its ground in protecting vital national interests at the cost of “nerves” and a promise not to invade Cuba.

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<sup>104</sup> Steven J. Brams, Game Theory and Politics (New York: The Free Press, 1975), pp. 39-47.

<sup>105</sup> Graham T. Allison, p. 22

## Conclusion

In introduction to this chapter, two general criticisms regarding the applications of game-theoretical models to explaining and predicting international conflicts among nations were presented. These criticisms included (1) most international conflicts do not have a clearly defined two-by-two structure; (2) the preference ordering of a nation in the game is rather more complicated to identify. From both theoretical and practical perspectives, we analyze and consider factors that help explain why game theorists tend to choose two-by-two models instead of  $n \times m$  models and how they can apply the models.

In contrast to McClelland's standards, game models are well equipped with the capacities to define crises by classifying them into types, to analyze the players' goals and decision-making processes in crises, and to provide likely solutions concerning crisis management. Besides, Lumsden highlights a variety of features with respect to applying game models like Prisoner's Dilemma to international conflicts. These features are: (a) neither player assumes war as the worst of all possible outcomes; (b) each player assumes the other player's most desired outcome as its own worst outcomes; (c) each player assumes peace much more positively than war; (d) neither player assumes peace more positively than his own initial goals.

In this chapter, we have reviewed three previous case studies: the Southwest Pacific Conflict of 1943, the Berlin Crisis of 1958-60, and Cuban Missile Crisis of 1962 in terms of game-theoretical analyses. In the aftermath of the descriptions and

analyses, we have used our theoretical perspective to conclude that a certain type of game model is suitable for a specific conflict, e.g., we better explain the decision-makers' goals and reactions during Cuban Missile Crisis of 1962 in terms of Chicken than Prisoner's Dilemma.

With further understanding regarding the features of a certain type of game model, we can formulate a multi-game model in which a couple of models are used and mixed in accordance with a given situation. Game models are allowed to shift from one to another when the structure of the game is altered as time goes on. In the following chapter, we will use this approach to decode the complicated dynamics of mainland China-Taiwan relations over the past years.

## CHAPTER V

### A CASE STUDY: MAINLAND CHINA-TAIWAN RELATIONS (1949-1995)

#### Introduction

The major purpose of this case study is to evaluate the capability of game-theoretical models in describing and explaining international conflicts. I believe that if there is any finding (e.g., the patterns of strategy adoption of mainland China and Taiwan over time) on the mainland China-Taiwan conflict produced as a result of game-theoretical analysis, it may contribute to our better understanding of international politics in the Asia-Pacific rim, although to a certain extent political reality is more “amenable to case-by-case analysis than broad-stroke characterizations.”<sup>106</sup>

In applying game-theoretical models, we note some basis assumptions of game theory during our analysis of mainland China-Taiwan relations. First, we assume that the government of each nation behaves like a rational actor in an iterated game and each nation may cooperate or defect in pursuit of its own optimal result. In other words, both countries are expected to adopt certain actions under specific situations according to their own preference orderings.

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<sup>106</sup> Tun-Jen Cheng, “On Taiwan-Mainland Dyad,” *Issues and Studies*, vol. 29, no. 2 (February 1993): 37-41.

During this case study, the attitudes and interventions exerted by a potential third party like the United States and the Soviet Union would be taken into account to some extent. These interventions may or may not influence players' strategies in a given phase. There may be a couple of break points for separating mainland China-Taiwan relations. In this case study, the relations between mainland China and Taiwan for the past four decades are divided into three individual phases: (1) the military confrontation phase (1949-1978); (2) the peaceful competition phase (1979-86); and (3) the premature cooperation phase (1987-1995).

In 1949, due to the military defeat in the mainland, Chiang Kai-shek's army retreated to Taiwan. After establishing the People's Republic of China in October 1949, the Chinese Communists were eager to "liberate" Taiwan with military muscle because the ROC's World War II ally, the United States, adopted a so-called "hands-off" policy to Taiwan. It was expected that Taiwan would be invaded and captured by the PRC's army in the early 1950s. Not until the outbreak of the Korean War in June 1950 did the United States change its position on Taiwan from abandonment of the ROC to the defense of Taiwan. Moreover, the U.S.-R.O.C. Mutual Defense Treaty of 1954 not only confirmed the American commitment to Taiwan's security but also gave Taiwan a chance to compete with mainland China for the sovereignty of China. In retrospect, the PRC has launched its army to invade Taiwan and attempted to resolve the Taiwan issue on three individual occasions: (1) when Chiang Kai-shek's army retreated to the island in 1949; (2) when military conflict broke out over the

offshore islands in 1954; and (3) when military conflict broke out over the offshore islands again in 1958. Due to the interventions and mediations of the United States and because of the pouring of the U.S. military aid to upgrade the KMT army's equipment, training, and personnel, the PRC's attempt was blocked. Such military confrontation (e.g., after the Second Straits Conflict of 1958 the PRC continuously shelled Quemoy and Matsu on odd days only) and political propaganda (e.g., a war of words), lasted up to 1979.

In 1979, the major reasons for the transformation of mainland China's Taiwan policy included: (a) the diplomatic victory; and (b) the need for implementing Deng's economic reforms. Obviously, the establishment of the official relations between the PRC and the U.S. on January 1, 1979 made Peking feel more confident of its ability to resolve the "Taiwan issue" on its own terms. It seemed as if the PRC sent a clear message to the Republic of China that "now that we have won the battle for international legitimization we do not need to try to prove it to you anymore."<sup>107</sup> Besides, the successful settlement of Hong Kong with the British government in 1984 also encouraged mainland China to adopt peaceful means and create a friendly environment for reunification with Taiwan.<sup>108</sup> After his return to power in 1978, Deng Xiaoping was eager to launch a series of economic reforms in company with the Four

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<sup>107</sup> Weiqun Gu, p. 29.

<sup>108</sup> George W. Tsai, "An Analysis of Current Relations Between Taiwan and Mainland China: A Political Perspective," Issues and Studies, vol. 29, no. 9 (September 1991): 27.

Modernizations<sup>109</sup>. To implement Deng's reforms, the PRC needed a peaceful international environment in which it could procure financial supports and human resources from foreign countries.<sup>110</sup> Thus, in January 1979 the PRC started to adopt a cooperative Taiwan policy calling for mutual contacts and exchanges. In contrast to mainland China's change in attitude and goal, the change of Taiwan's mainland China policy of 1987 was based on the following considerations:

1. It was a response to mainland China's less hostile and more "cooperative" approach to Taiwan.

2. In order to reflect humanitarian considerations, i.e., allow Taiwan residents to visit their relatives on mainland, Taiwan adjusted its mainland China policy, as some ROC officials have insisted.

3. Taiwan's policy adjustment indicated that Taiwan was eager to reinforce cultural bonds and other links with mainland China, e.g., its tacit approval of non-governmental cultural, athletic, and academic exchanges with the mainland and its lifting of the ban on nonpolitical mainland publications.

4. Taiwan has been partly forced by economic pressures (due to the gradual decline of competition capacity in the international market) to adjust its policy toward

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<sup>109</sup> Under the leadership of Deng Xiaoping, the PRC began its Four Modernizations (in agriculture, industry, national defense, and science and technology) in 1979.

<sup>110</sup> Steven M. Goldstein, "Nationalism and Internationalism: Sino-Soviet Relations," in Thomas W. Robinson and David Shambaugh, eds. Chinese Foreign Policy: Theory and Practice (New York: Oxford University Press, 1994), pp. 250-251.

mainland China.<sup>111</sup>

As for the assignment or identification of a specific game-theoretical model to a given phase, I adopt the hypothesis: the choice of an adequate model for a certain conflict situation is based on two principles-- the subjective recognition of the players and the objective constraint of the conflict situation. That is, we assume that the structure of the game (or model) will be modified as the players change their initial goals and their corresponding strategy under the influence of outside conditions.

According to the preceding principles, we will examine the military confrontation phase by means of a Deadlock model, use the framework of Prisoner's Dilemma to analyze the peaceful competition phase, and scrutinize the premature cooperation phase under the structure of Chicken. Bau has developed three models to explain the interactions between mainland China-Taiwan at the similar time period as we have set: A Deadlock Game (1949-78), An Emerging Prisoner's Dilemma Game (1979-86), and A Mature Prisoner's Dilemma Game (1987-88). Basically, we will adopt his choice of the first two models for the relevant period. However, due to more information available and data collected, also because of the goal of evaluating our hypotheses as well as models, we will take advantage of Chicken as the major model to deal with the third phase instead of the model he suggests.

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<sup>111</sup> Ibid., pp. 27-29.

## The Military Confrontation Phase (1949-1978)

### The Background of the Conflict

Two political entities across the Taiwan Strait, both claiming to represent the legitimate regime of China, have confronted each other since 1949. One is the People's Republic of China (PRC), the other is the Republic of China on Taiwan. The former won the Chinese Revolution of 1949 and has effectively controlled the mainland for the past four decades. The latter was compelled to retreat to Taiwan after it lost the battle to the Communists. The major conflict between both sides lay in struggling for sovereignty to represent "one China."<sup>112</sup>

As soon as Chiang's army retreated to Taiwan, the PRC began its military pressure on some offshore islands. The Chinese Communists attempted to give Chiang's regime a final shot in the early 1950s when they were informed of the American position toward Taiwan. In a news conference held on January 5, 1950, President Harry S. Truman, despite the recommendation of the Joint Chiefs of Staff which suggested helping the ROC government defend Taiwan<sup>113</sup>, announced in a

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<sup>112</sup> Although both sides agree that there is only one China, both mainland China and Taiwan have their own explanations of the concept of "one China." To mainland China, "one China" simply means "the People's Republic of China (PRC)," with Taiwan as a province or a special administrative region after reunification. By contrast, to Taiwan, "one China" indicates the "Republic of China (ROC)," founded in 1911, with sovereignty over all of China. However, nowadays the ROC only has jurisdiction over Taiwan, Penghu, Quemoy, and Matsu. Taiwan is a part of China, and the Chinese mainland is a part of China as well.

<sup>113</sup> Time, 60, no. 2 (January 9, 1950): 9-10.

public statement the resolution of the American government to halt its constant interventions in the Chinese Civil War:

The United States has no predatory designs on Formosa (Taiwan) or on any other Chinese territory. The United States has no desire to obtain special rights or to establish military bases on Formosa at this time. Nor does it have any intention of utilizing its armed forces to interfere in the present situation. The United States will not pursue a course which will lead to involvement in the civil conflict in China. Similarly, the United States government will not provide military aid or suggestions to Nationalist forces (Chiang's regime) on Formosa.<sup>114</sup>

To be sure, the following "hands-off" policy towards Taiwan was based on this statement. Losing its faithful ally since World War II, the ROC confronted real problems in defending Taiwan. The American Central Intelligence Agency (CIA) and the State Department intelligence section estimated that Chiang could not "effect political and military adjustments sufficiently realistic to make possible a successful defense of Taiwan."<sup>115</sup> Also, Chen Cheng, one of Chiang's major subordinates, frankly confessed that Taiwan's defense was "barely adequate", and there may be "no

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<sup>114</sup> "The President's News Conference on January 5, 1950," Public Papers of the president of the US: Harry S. Truman (Washington, D.C.: U.S. Government Printing Office, 1965), p. 11. Secondary source cited from Dennis Van Vranken Hickey, United States-Taiwan Security Ties: From Cold War to Beyond Containment (Westport, Connecticut: Praeger Publishers, 1994), p. 18.

<sup>115</sup> CIA report ORE 7-50, 20 March 50, f.1, President's Secretary's Files, Box 257, Papers of Harry S. Truman, Truman Library, Independence, Missouri (hereafter Truman Papers). Secondary source cited from Steve Tsang, "Chiang Kai-Shek and the Koumintang's Policy to Reconquer the Chinese Mainland, 1949-1958," in Steve Tsang, ed. In the Shadow of China: Political Developments in Taiwan Since 1949 (Honolulu, Hawaii: University of Hawaii Press, 1993), p. 50.

prospect for counterattack on mainland in foreseeable future.”<sup>116</sup> In practice, the enemy which Chiang’s army faced was the 3.7 million strong People’s Liberation Army (PLA) which, up to mid-1950, had the capability to send 200,000 troops by sea to invade Taiwan.<sup>117</sup>

The outbreak of the Korean War on June 25, 1950, forced the Truman administration to reevaluate its policy towards Taiwan. In consideration of Taiwan’s strategic importance and at the same time to contain the likely expansionism of Communists into Southeast Asia, i.e., the United States would like to keep relations with a well-known Chiang regime rather than a uncertain hostile Communist regime, the Truman administration dramatically reversed its position toward Taiwan. On June 27 1950 President Truman ordered the Seventh Fleet to “neutralize” the Taiwan Strait. That is, the United States formally reinstated intervention in the Chinese Civil War with military muscle after a decade (1940-1949) of military and economic aid to the KMT.<sup>118</sup> Not until the PRC ’s involvement in the Korean War in October 1950 did American commitment to Taiwan’s security become a firm policy.

After Dwight Eisenhower entered the White House, he was supposed to have

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<sup>116</sup> Taipei to Secretary of State, telegram 249, 14 August 1950, “Neutralisation of Formosa,” Records with respect to the Korean War, Box 6, Truman Papers. Secondary source cited from Steve Tsang (1993), p. 51.

<sup>117</sup> Nieh Jung-chen, hui-i lu (Hong Kong: Ming Pao Ch’u-pan-she, 1991), p. 645.

<sup>118</sup> “Statement by the President on the Situation in Korea,” Public Papers, p. 492. Secondary source cited from Dennis Van Vranken Hickey (1994), p. 20.

“unleashed” Chiang Kai-shek on the mainland in February 1953. Chiang was allowed to launch any level military actions against the mainland. However, the United States set an unwritten condition, i.e., Chiang’s regime was to consult with the United States prior to initiating large-scale military actions.<sup>119</sup> During the First Straits Crisis in late 1954 and early 1955, for the first time Chiang formally promised the United States that his government would neither invade nor launch large-scale attacks on the mainland without consulting with the United States.<sup>120</sup> This unwritten understanding between both countries was consolidated in the Mutual Defense Treaty. In the negotiations for the Mutual Defense Treaty, Chiang begged the United States to keep secret what he had promised, so that he would be free to preach in public the theme of a military recovery of the mainland. Needless to say, to Chiang, abandoning the idea of recovering the mainland meant losing his key purpose and damaging the regime legitimacy.<sup>121</sup> In 1958, Taiwan was under threat from the PRC in the Second Straits Crisis. The Communist artillery was heavily shelling Quemoy, one of the offshore islands under control of Chiang’s regime. The ROC Air Force achieved professional superiority over its counterpart. Its fighters shot down twenty-nine Chinese

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<sup>119</sup> “Record of Conversation when President Receive Dulles,” 9 September 1954, f.9, Folder B.212(a), Box 154, Koo Papers; “Notes on Talk with Rankin,” 4 September 1953, FC10111/62, FO371/105203, Public Record Office, London. Secondary source cited from Steve Tsang (1993), p. 53.

<sup>120</sup> Chiang’s telegram to Washington Embassy, 29 January 1955, File B.13.1(e), Box 145, Koo Papers. Secondary source cited from Steve Tsang (1993), p. 53.

<sup>121</sup> Ibid.

Communist MIG fighters, including MIG-17s.<sup>122</sup> However, in spite of the impressive performance of his army, Chiang did not take the further step of bombing targets on the mainland. Conversely, after the Second Straits Crisis, he agreed to issue a joint communique with the United States, in which he noted:

The Government of the Republic of China considers the restoration of freedom to its people on the mainland its sacred mission. It believes that the foundation of this mission resides in the minds and the hearts of the Chinese people and that the principal means of successfully achieving its mission is the implementation of Dr. Sun Yat-sen's three people's principles (i.e., nationalism, democracy, and social well-being) and not the use of force.<sup>123</sup>

This statement formally ruled out the use of force for the recovery of the mainland. Also, it reflected a gradual change in Chiang's attitudes to the sacred mission. Until the latter part of the 1950s, Chiang began to give greater attention to developing Taiwan into a model that would appeal to the Chinese on the mainland. Also, developing Taiwan provided Chiang the opportunity to consolidate his rule and make Taiwan much more difficult to invade. That is, the strategy to counter-attack the mainland had in practice gradually been replaced by a strategy to recover the mainland by political means.

According to mainland China's official announcements concerning Taiwan

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<sup>122</sup> "Government," Taiwan, June 1960, f.6. Formosa (China) Far East Trip (5), Whiteman Files: International Series Box 10, Eisenhower Papers. Secondary source cited from Steve Tsang (1993), p. 55.

<sup>123</sup> "Report on NSC5723," 15 April 1958, annex B, NSC--5523--Taiwan, White House Office Files: Special Assistant to the NSC Box 22, Eisenhower Papers. Secondary source cited from Steve Tsang (1993), p. 55.

policy, during this phase mainland China's strategies could be separated into three steps, i.e., "liberation by force," (1949-1954) "liberation by peaceful means but reserve the possibility of using force," (1955-1969), and "returning to and identifying with the motherland," (1970-1978).

After the Korean War (1950-1953 ), the United States and Taiwan signed the U.S.-R.O.C. Mutual Defense Treaty, and the Seventh Fleet was dispatched to the Taiwan Strait in order to protect Taiwan from mainland China's attack. To protest the signing of the U.S.-R.O.C. Mutual Defense Treaty and examine to what extent the American commitment toward Taiwan was in the treaty, the PRC launched two rounds of Straits Conflict: the First Straits Conflict of 1954 and the Second Strait Conflict of 1958. Although these military actions failed to pressure Taiwan to capitulate, they brought back a confirmed message that the U.S.-R.O.C. Mutual Defense Treaty could really retard the Communists' pursuit of reunifying China by force in the foreseeable future. Under such difficult situations, mainland China tended to adopt a relatively peaceful strategy, i.e., take advantage of political means instead of military coercion.

In the early 1970s, the transformation of the American global strategy shed a light on the resolution for the PRC's predicament in the international arena. In general, the Nixon administration's pursuit for the normalization of U.S.-PRC relations aimed at on the one hand pressuring Hanoi to agree with a settlement of the Vietnam War by means of persuading the PRC to reduce support for North Vietnam; on the other hand,

impeding the Soviet expansionism , as Nixon noted that “the greatest incentive for Soviet cooperation in Vietnam, was our new relationship with the Chinese.”<sup>124</sup>

To be sure, the achievement of diplomatic results, e.g., the replacement of Taiwan’s seat in the United Nations, and sign of a joint communique, Shanghai Communique, with the United States on February 28, 1972<sup>125</sup>; more importantly, establishing official relations with the United States in 1979, mainland China felt more confident in pursuing a peaceful Taiwan policy in the coming 1980s. The establishment of diplomatic relations with the United States was as if the PRC claimed to the ROC that “we have won the battle for international legitimization we do not need to prove it to you anymore.” At the same time, by it the PRC sent a message to the United States: the Chinese Communist Party was willing to solve its problems with the KMT in peaceful means if the U.S. could establish friendly and normal relations with the PRC and formulate a more hands-off policy with regard to

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<sup>124</sup> Richard M. Nixon, RN: the Memoirs of Richard Nixon (New York: Warner Books, 1979), p. 511.

<sup>125</sup> There are differences with respect to the contents of the joint communique between the United States and mainland China. The American version stated that “the United States acknowledges that all Chinese on either side of the Taiwan Strait maintain there is but one China and that Taiwan is a part of China. The United States government does not challenge that position. It reaffirms its interest in peaceful settlement of the Taiwan question by the Chinese themselves.” By contrast, the mainland China’s version noted that “ the government of the People’s Republic of China is the sole legal government of China; Taiwan is a province of China. . . . [T]he liberation of Taiwan is China’s internal affair in which no other country has the right to interfere.” See Jonathan D. Spence, The Search for Modern China (New York: W. W. Norton, 1990), p. 632.

the Taiwan issue.<sup>126</sup> Although the PRC implies to solve Taiwan issue peacefully, it maintains the possibility of using force against Taiwan under certain conditions such as: (a) Taiwan's pursuit of independence from the mainland; (b) the interference of foreign powers; (c) the internal disturbance of Taiwan.

### The Likely Payoffs of the Game

We borrow Bau's model displayed in Matrix 15 (Figure 22) to describe and discuss the configuration of payoffs for the players in the phase of military confrontation. According to the logic of a Deadlock game, Matrix 15 indicates that it seems inevitable and rational for both sides to choose defection, i.e., confrontation instead of cooperation with each other because the defecting strategy can help them achieve the initial goals and there exists no mutual interest between both sides because the payoffs for defection overweighed that for cooperation. For example, the payoffs for Taiwan would be either Taiwan's counterattack over the mainland or the retention of the status quo if Taiwan took a defective position. Under a deadlock situation in which defection promises to escalate the minimal expected payoff, i.e., the military confrontation, Taiwan as well as mainland China would throw all their weight into defection because each country has nothing to lose.

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<sup>126</sup> Weiqun Gu, Conflicts of Divided Nations: The Cases of China and Korea (Westport, Connecticut: Praeger Publishers, 1995), p.29.

		Mainland China	
		Cooperate	Defect
Taiwan	Cooperate	<p>3</p> <p>Recognition of status quo; Taiwan may recover the mainland.</p> <p>3</p>	<p>1</p> <p>Taiwan is taken over by Beijing.</p> <p>4</p>
	Defect	<p>4</p> <p>Taiwan recovers the mainland.</p> <p>1</p>	<p>2</p> <p>Maintenance of confront- ation; Taiwan will be liberated eventually</p> <p>Maintenance of confrontation; Mainland will be recovered eventually</p> <p>1</p>

Figure 22. Matrix 15: The Military Confrontation Phase.

As for Bau's model, there are a couple of comments worth making. First of all, by late 1948, or more exactly no later than 1952-53 after the Communist's Land Reform Movement in association with the previous social revolution and transformation initiated by the Chinese Communist in the early 1940s, the KMT's

social-political basis of power was greatly undermined.<sup>127</sup> Thus, there would be no option for Taiwan to retake the mainland. In addition, after Taiwan renounced the use of force to recover the mainland in 1958, the chance for the reunification of China under the guidance of Taiwan was almost zero. If the preceding argument is true, then in game theoretical terms, the upper left cell of Bau's model would be empty. Of course, there may be another interpretation. In addition to Bau's analysis, Gu argues there were two peak activity periods in which the KMT was eager to recover the mainland: one was from 1950-1953; the other was from 1962-1964. For example, on July 17, 1953, with air cover and naval support, Chiang sent around 10,000 troops in landing vessels and amphibious tanks to take Bongshan Island in Southern Fujian Province of the PRC, although this attempt failed and ended up with 3,379 casualties after two days of battle.<sup>128</sup> In the early 1960s, the ROC's Intelligence Bureau of the Defense Ministry formulated and implemented the so-called Sea Prowess Plan. There were 1,800 crack military intelligence agents involved in this plan, trained and dispatched to penetrate the society of the PRC to collect intelligence and to destabilize the PRC government. This plan was the largest that was carried out by Taiwan without U.S. approval. To a certain extent the plan had caused the PRC's serious concern, because the PLA along the coast provinces was on full military alert

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<sup>127</sup> Frederick C. Teiwes, "The Establishment and Consolidation of the New Regime," in Roderick Macfarquhar, ed. The Politics of China 1949-1989 (New York: Cambridge University Press, 1993), pp. 33-36.

<sup>128</sup> Weiqun Gu, p. 46.

all year round. Not until the PRC had successful talks with the U.S. at Warsaw regarding Taiwan's activities was the Sea Prowess II Plan, scheduled to be implemented in 1965 canceled under the U.S. pressure.<sup>129</sup> Judged from the perspective of the KMT's military activities, Bau's assignment for this cell can remain. If not, what kind of payoff would be assigned to replace the old one? Or, do we just leave this cell empty? Then, in theory, what would happen with such a settlement? Let's answer the latter question first. It would be highly suspicious for the players to structure their preference orderings, let alone to choose a strategy, if the upper left cell is empty. That is, there would not be a game. Otherwise, we are forced to create a new scenario to occupy the empty cell. In retrospect, the proposal, "coexistence" or "mutual recognition" in the international community, suggested by the U.S. in the 1960s may be the one when mainland China and Taiwan competed with each other for representing the China. However, at that time, this solution was not preferred by the political leaders of both sides because the leaders influenced by the Chinese culture or embedded with personal ambition tended to believe that to allow the opponent to exist obviously implies a confession of one's failure. Then, they would lose face and have no excuse to persuade their compatriots if they made any concession to the opponent's favor. In terms of both the logic of a Deadlock game and the leaders' subjective preference, the players apparently would like to adopt defection rather than cooperation in this period.

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<sup>129</sup> World Journal, July 9, 1990, p. 3.

Another worth-while point is that, due to the American commitment to Taiwan's security in the U.S.-R.O.C. Mutual Defense Treaty, it would have been almost impossible for the PRC to take over Taiwan by military muscle. In addition, there is only one thing for sure in Bau's model, i.e., both countries gradually tend to recognize a separated China under two opposing political entities.

### The Players' Preference Orderings and Strategies

As for the preference ordering of mainland China, mainland China's best expected outcome at this time would have been to defeat Taiwan; the second best outcome would be to recognize the status quo, i.e., mutual confrontation, and wait for a chance to lead to the reunification of China.; the worst outcome would be to totally capitulate to Taiwan; and the second worst outcome would be mutual cooperation in which each side perceives itself as the possible loser. Needless to say, mainland China chose defection as a dominant strategy in accordance with its preference ordering. This defecting strategy consisted of military coercion and political critique. During the 1950s, the PRC launched two military actions against Taiwan. The First and the Second Straits Crisis initiated by the PRC were solved by Chiang's government with American military aid. Since facing the failure of military attack, the PRC has transformed its strategy from military means to political means. That is, it began to broadcast the idea of "one China" in the international community and sell Zhou Enlai's formula, "the peaceful liberation of Taiwan," to the Taiwan regime. However,

at the same time, the PRC was eager to seek the replacement of the ROC's seat in any international organization, especially in the United Nations. After it obtained the ROC's seat in the UN, the PRC went further to isolate Taiwan in the international occasions. Such a series of actions indicated that the PRC still adhered to a defecting strategy, although it expected to solve the "Taiwan issues" peacefully, i.e., by political means instead of military threat. Besides, Zhou' proposal to some extent exposed the likely transformation of the PRC's attitude and strategy on Taiwan policy. Not until did the PRC establish the official relations with the United States in January 1979, it formally began to pursue a cooperative strategy toward Taiwan.

To Taiwan, although the recovery of the mainland by force was slim or zero in reality, Chiang's regime still believed that this cardinal mission could be fulfilled if Taiwan followed the direction of Dr. Sun Yet-sen's three people's principles. In other words, up to the 1960s, Taiwan resorted to political means to struggle for the sovereignty of China ,though the Kuomintang continuously preached to mainland veterans and Taiwan residents that it would fight back someday somehow. Due to the failure of Great Leap Forward (1962-64), up to latter 1960s, the PRC sunk into the chaos of the Cultural Revolution, and at the same time the Sino-Soviet rift widened beyond repair. It is said that Chiang's regime tried to seek rapprochement with the Soviet Union in order to further isolate mainland China. For example, in 1967, Prime Minister Yen Chia-kan, reversed the government's usual slogan that "those who are not our friends are our enemies," saying instead that "those who are not our enemies

are our friends.” The Soviet Union showed signs of interest in the likely development of Taiwan-Soviet relations. Soviet publications began carrying occasional references to Taiwan as a “country,” and a Soviet representative at the UN implied that the Soviet Union might support the accession of the PRC to the UN under the condition that the ROC kept its seat.<sup>130</sup> It is reported that Mao Zedong worried about the likely cooperation between Chiang Kai-shek and the Soviet Union after the Sino-Soviet split. In 1965, Mao dispatched someone to Taiwan to feel out Chiang on this. Later, Mao got a message from Chiang in which he noted that he would “never be on the side of the Soviets.”<sup>131</sup>

Like the PRC, Taiwan made a rational choice to play defection under such a military confrontation situation and tried to seek outside help to increase political resources for the future negotiation with the PRC. In this phase, Taiwan’s strategy was very simple. On the one hand, Taiwan cooperated with the United States for the maintenance of the stable status of Taiwan. On the other hand, it insisted on the claim of sovereignty over the mainland and firmly reacted to any threats, either military or political, from the PRC.

Information relative to the interaction between mainland China and Taiwan

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<sup>130</sup> Simon Long, Taiwan: China’s Last Frontier (New York: St. Martin’s Press, 1991), pp. 147-148.

<sup>131</sup> Reportedly, Mao did this without prior consulting with his colleagues. In Chiang’s message to Mao he advocated that the KMT and the CCP jointly administer the coastal provinces on the Chinese Mainland. See Gu, p. 217, note. no. 119. Gu’s interview with a confidential source.

during this phase was represented in Tables 1 and 2. According to Tables 1 and 2, we can draw a few conclusions related to the PRC's Taiwan policy in this phase:

1. Liberating Taiwan by force is the constant position of the PRC, though according to Zhou's speech of 1955 the PRC may resort to peaceful means to unify with Taiwan. The PRC continuously declared that Taiwan is part of China and the PRC has the sovereignty to decide when and how to seek reunification with Taiwan. The PRC treated the Taiwan issue as Chinese internal affairs which left no room for foreign powers to intervene.

Table 1

Mainland China's Defection in the First Phase

Year	Mainland China's Defecting Actions/ Announcements
October 24, 1949	The PRC dispatched two divisions to invade Quemoy. Without any resupplies coming from the mainland, the PLA lost the battle when confronted with 40,000 KMT troops.
January 7, 1950	People's Daily indicated that Taiwan would be "liberated" by force this year.
January 1950	Beijing's Premier Zhou Enlai cabled the UN secretary general, Trygve Lie, demanding that mainland China should replace Taiwan in its seat in the UN.
January 1955	The PLA launched an assault on the island of Dachen.
August 23, 1958	The PLA began shelling of Quemoy.

Table 1—Continued

Year	Mainland China's Defecting Actions/ Announcements
After 1971	Beijing tried to force Taiwan out of international organizations, and undermined its international status.
By the end of 1978	People' Daily used to label Taiwan leaders as a "ruling clique."

Sources: Compiled by the author according to the data represented in Appendix: Peking-Taipei Interaction (1949-78), see Tzong-ho Bau, "Taipei-Peking Interaction as a Two-Person Conflict: A Game-Theoretical Analysis, 1949-88," *Issues and Studies*, vol. 27, no. 10 (October 1991): 90; Weiqun Gu, *Conflict of Divided Nations: The Cases of China and Korea* (Westport, Connecticut: Praeger, 1995), pp. 22-37.

Table 2

## Taiwan's Defection in the First Phase

Year	Taiwan's Defecting Actions and Announcements
January 1, 1950	Central Daily News indicated that President Chiang Kai-shek planned to counterattack and recover mainland in 1950.
Early 1950s	General Li Mi led KMT troops, which had escaped to Burma after 1949, to invade Yunnan Province.
1949-54	Taiwan launched a couple of military harassment and attacks around the areas of East, Central South, Southwest, and Northwest China.

Table 2—Continued

Year	Taiwan's Defecting Actions and Announcements
July 17, 1953	Taiwan sent around 10,000 troops to try to take Dongshan Island in Southern Fujian Province.
1957-58	Taiwan engaged in numerous guerrilla activities in Tibet.
Early 1962	Chiang Kai-shek attempted to send army to mainland to take advantage of the timing of mainland China's economic crisis.
1962-64	The Intelligence Bureau of the Defense Ministry formulated and implemented the Sea Prowess Plan.
Up to 1969	Taiwan launches occasional short-range missions against mainland; dispatches high-altitude planes to gather intelligence, and maintains regular air and sea patrols in the Taiwan Strait.
1949-78	Central Daily News referred to mainland China's leaders as "Communist bandits."

Sources: Compiled by the author according to the data represented in Appendix:

Beijing-Taipei Interaction (1949-78), see Tzong-ho Bau, "Taipei-Beijing Interaction as a Two-Person Conflict: A Game-Theoretical Analysis, 1949-88," *Issues and Studies*, vol. 27, no. 10 (October 1991): 90; Weiqun Gu, *Conflict of Divided Nations: The Cases of China and Korea* (Westport, Connecticut: Praeger, 1995), pp. 37-49.

2. The proposal of peaceful negotiation is based on the significant formula, i.e., after reunification the PRC would be the central government; Taiwan would be a

local government in a specific administrative region.

3. The PRC absolutely objects to any intention to create “two Chinas,” “one China, one Taiwan,” and to sell the idea of “Taiwan independence,” and “Taiwan’s status is undetermined”. In short, mainland China’s ultimate intention was to take over Taiwan; by contrast, Taiwan was eager to resist the likely threats from the PRC.

### The Solution of the Game

Since the interactions between both countries were fitted into the framework of a Deadlock game, the final payoffs for the players were determined, i.e., the status of military confrontation inevitably existed across the Taiwan Straits. In 1979, the PRC began to tend to play more cooperative strategies than defecting ones. Launching economic reforms and the Four Modernizations, the PRC gradually recognized that there exist mutual interests (e.g., the mainland needs money, technology, and human resources while Taiwan lacks cheap labors and a broad market for its products) between both sides. Besides, the PRC observed that “Taiwanese ideology”<sup>132</sup>, and the idea of Taiwan independence have gradually prevailed among people when Taiwan’s stable economic development and the undertaking political reform are in

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<sup>132</sup> The concept of Taiwanese ideology was identified as a general “feelings of anger and frustration against the KMT, and sorrow for the repressed lives they were suffering.” See, Wing-chung Pan, How the Opposition Evolved: A Case Study of Taiwan’s Democratization (Master’s Thesis, Western Michigan University), p. 40. Relevant discussion, see Guo-chang Huang, Chinese Ideology and Taiwanese Ideology (Taipei, Taiwan: Wu-nan Press, 1992).

good shape. The PRC reckoned that it is unbeneficial to maintain the status of military confrontation with Taiwan because continuous military coercion might push Taiwan to choose the way of independence instead of reunification with the PRC in the long run. In other words, the mutual interests obviously would outweigh the benefit derived from defection with Taiwan. This consideration directly resulted in the transformation of Taiwan policy in 1980s.

To Taiwan, it realized that eliminating military conflict with the PRC could free resources necessary to the modernization of Taiwan and the economic growth. In addition, with the Kuomintang's Taiwanization<sup>133</sup> in the 1970s and the upheaval of opposition forces (or the consolidation of Taiwanese ideology), the hostility to the Chinese Communists gradually declined, although Chiang's regime still educated people to counter the Communist regime on the mainland for the sake of legitimacy. Because both players' subjective attitudes to the game have changed in association with the transformation of the objective environment, the configuration of the game shifted from Deadlock to Prisoner's Dilemma.

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<sup>133</sup> Taiwanization policies, or the KMT's personnel policies, initiated by Chiang Ching-kuo intended to recruit and promote more educated Taiwanese to the KMT's decision making and legislative organizations. More discussion, see Masatake Wakabayashi, Democratization in a Divided Country (Taipei, Taiwan: Xue-ying Culture Press, 1994), p. 183. (A translated version from Japan edition "Higashiazia no Kokka to Syakai 2 Taiwan," the University of Tokyo Press, 1992.)

## The Peaceful Competition Phase (1979-1986)

### The Background of the Conflict

As we mention above, because of the victory of legitimacy competition over Taiwan (e.g., the establishment of diplomatic relations with the United States in 1979) and the need for a peaceful international environment to implement Deng's reforms, mainland China dramatically transformed its Taiwan policy. In January 1979 mainland China began to urge peaceful exchanges, negotiations, and reunification with Taiwan though it would not renounce the use of force against Taiwan under any condition. That is, mainland China searched for cooperation with Taiwan on the issue of China reunification.

On January 1, 1979, the Standing Committee of the National People's Congress (NPC) issued a message to Taiwan, in which hopes that "Taiwan returns to the embrace of the motherland at an early date so that we can work together for the great cause of national development." Besides, in order to call for negotiations to end the military confrontation situation, the Committee announced the cessation of the shelling of the offshore islands, Quemoy and Matsu, which had been carrying out every other day since 1958.<sup>134</sup>

In September 30, 1981, Ye Jianying, Chairman of National People's Congress

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<sup>134</sup> "NPC Standing Committee Message to Compatriots in Taiwan," Beijing Review, vol. 22, no. 1 (January 5, 1979): 16-17.

(NPC) Standing Committee, proposed a “Nine Point Opinion” as a guideline for the unification of China, which included: (1) The Chinese Communist Party (CCP) and the Kuomintang (KMT) should begin negotiation with equal status; (2) The two sides on the Taiwan Strait should agree on mail, trade, transportation, visitation and tourist exchanges, and such activities as academic, cultural, and athletic events; (3) Taiwan would be given special regional status with political autonomy and its own military, and the Beijing central government would not interfere in its internal affairs; (4) Taiwan’s current socioeconomic system would not need to be changed, nor its life style. Private property, business, and inheritance would be allowed. Taiwan would also be able to continue its economic and cultural relations with other nations; (5) Taiwan leaders would be second to Beijing in occupying key national positions; (6) The central government in Beijing would assist Taiwan if it encountered financial hardship; (7) Taiwan residents who wanted to reside in the mainland would not be discriminated against, and they would enjoy the freedom to move back and forth across the Taiwan Strait; (8) Beijing would protect Taiwan investment interests on the mainland; and (9) China’s unification was the responsibility of all Chinese, therefore Beijing welcomed suggestions from Taiwan or elsewhere on how to attain the goal of reunification.<sup>135</sup> In addition, in June 1984, Deng Xiaoping began to advocate a new formula for a peaceful reunification of China, i.e., “one country, two systems”

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<sup>135</sup> “Chairman Ye Jianying’s Elaboration on Policy Concerning Return of Taiwan to Motherland and Peaceful Reunification,” Beijing Review, vol. 40, no. 1 (October 5, 1981): 10-11.

principle. Mainland China emphasized that under the new formula Taiwan would become a special administrative region, enjoying a high degree of autonomy, and maintaining its own administrative and judicial systems as well as military forces, and even its own budget after reunification with the mainland. The central government on the mainland would send no personnel, either civil or military, to Taiwan.<sup>136</sup> Actually, this new formula was based on Deng's preceding five "opinions" on unification proposed in June 1983.

What was Taiwan's response to these proposals? Partly due to being isolated from international community, partly because of the lack of powerful patron like the United States, for security's sake, Taiwan stuck to its confrontation strategy and viewed mainland China's proposals as sugar-coated poison or mere lip service. Put another way, up to this phase, Taiwan took care of its security more than struggling for the legitimate representation of China with mainland China in the international arena though it adopted a defecting strategy.

Since 1949, Taiwan has been under the shadow of being double crossed by mainland China. Thus, when mainland China eliminated its hostile attitude to Taiwan, and proposed a couple of apparently practical resolutions for the reunification of China, Taiwan preferred defection to cooperation. Although the weaker actor is much more vulnerable to its opponent's double cross, it does not mean that there is no room

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<sup>136</sup> "Deng Xiaoping's Speech on 'one country, two systems'," Beijing Review, vol. 29, no. 5 (February 3, 1986): 25-26.

for Taiwan to adopt cooperative reaction.

### The Likely Payoffs of the Game

According to Bau's model, the interaction between mainland China and Taiwan for this phase could be displayed as Matrix 16 (Figure 23).

		Mainland China	
		Cooperate	Defect
Taiwan	Cooperate	<p>2</p> <p>Reunification under mutual recognition of political systems of opposing sides; Taiwan as local government Recognition of status quo; Taiwan may lose to Beijing.</p> <p>3</p>	<p>1</p> <p>Taiwan is gradually influenced by mainland and will possibly be taken over in the future Taiwan is taken over by Beijing</p> <p>4</p>
	Defect	<p>4</p> <p>The mainland is gradually influenced by Taiwan and may lose to it eventually Taiwan recovers mainland</p> <p>1</p>	<p>3</p> <p>Tension between two sides continues; Prospects for reunification slim Maintenance of confrontation; Mainland will be recovered eventually</p> <p>2</p>

Figure 23. Matrix 16: The Peaceful Competition Phase.

In comparison to Deadlock, Prisoner's Dilemma provides an opportunity for the players to cooperate. That is, both countries acknowledge that they can secure a better outcome by means of cooperation. For example, mainland China may reunify China with Taiwan at the relatively low cost if it calls for peaceful reunification by enlarging the scope of mutual exchanges and contacts.

However, due to lack of mutual trust and fear of being double-crossed, the cooperative strategy in nature is more unstable than the defecting one. If so, the conflict in a Prisoner's Dilemma game is determined to ending up with a negative payoff (defection pair) in contrast to the result of cooperation.

#### The Players' Preference Orderings and Strategies

Matrix 16 indicates that defection is the dominant strategy for both mainland China and Taiwan, and the equilibrium is located at (2, 3). To achieve a better outcome, mainland China adopted a cooperative strategy. That is, the mainland leaders assumed that the use of force against Taiwan would not necessarily bring about the reunification of China but may instead entail international intervention and sanctions. Mainland China also understood that it would be impossible to pursue cooperation with Taiwan if Taiwan remained a defecting strategy. The purpose of most mainland China's proposals for peaceful unification aims at creating a friendly environment in which Taiwan may shift from a Deadlock game to a Prisoner's Dilemma game and understand that mutual interests could be raised through cooperation with each other. Since 1979 mainland China has tried hard to isolate

Taiwan in the international community, this defection-oriented action was viewed as a threat meant to increase the cost of Taiwan choosing a defecting strategy.

To Taiwan, for the sake of security, due to lack of symmetric resources as mainland China, also because of the scare of being double crossed, Taiwan could not help standing firmly with a defecting strategy while the conciliatory attitudes mainland China expresses is just in the surface, i.e., Taiwan can not trust mainland China's promises until it renounces the use of force against Taiwan. In short, till the end of this phase, Taiwan has hesitated to adopt a cooperative strategy though it knows well that cooperation would promise to increase both sides' outcomes in a Prisoner's Dilemma game.

The data with respect to the interaction between mainland China and Taiwan for this phase are displaying in Tables 3, 4, 5, and 6.

Table 3  
Mainland China's Cooperation in the Second Phase

Year	Mainland China's Cooperation Actions/Announcements
Jan. 1979	Mainland China stopped shelling Quemoy and Matsu after establishment of diplomatic relations with the United States and invites Taiwan to open up "three links" (mail, trade, and tourism) and "four exchanges" (academic, cultural, scientific, and athletic) with the mainland.
	Deng Xiaoping told visiting US senators that Taiwan would be able to retain its current political and economic system and even its own army after reunification though it is required to surrender sovereignty to

Table 3—Continued

Year	Mainland China's Cooperation Actions/Announcements
	mainland China.
Sep. 1981	<p>Chairman of National People's Congress (NPC) Standing Committee, Ye Jianying proposed a "Nine Point Opinion" as a guideline for the unification of China, which includes: (1) The Chinese Communist Party (CCP) and the Kuomintang (KMT) should begin negotiation with equal status; (2) The two sides on the Taiwan Strait should agree on mail, trade, transportation, visitation and tourist exchanges, and such activities as academic, cultural, and athletic events; (3) Taiwan would be given special region status with political autonomy and its own military, and the Beijing central government would not interfere in its internal affairs; (4) Taiwan's current socioeconomic system would not need to be changed, nor its life style. Private property, business, and inheritance would be allowed. Taiwan would also be able to continue its economic and cultural relations with other nations; (5) Taiwan leaders would be second to Beijing to occupy key national positions; (6) The central government in Beijing would assist Taiwan if it encountered financial hardship; (7) Taiwan residents who wanted to reside in the mainland would not be discriminated against, and they would enjoy the freedom to move back and forth across the Taiwan Strait; (8) Beijing would protect Taiwan investment interests on the mainland; and (9) China's unification was the responsibility of all Chinese, therefore Beijing welcomed suggestions from Taiwan or elsewhere on how to attain the goal of reunification.</p>
Oct. 1981	<p>CCP General Secretary Hu Yaobang issued open invitation to Taiwan's leaders to visit mainland. He made an appeal to nationalist sentiment and asked leaders in Taiwan to work with mainland for reunification of China.</p>

Table 3—Continued

Year	Mainland China's Cooperation Actions/Announcements
Dec. 1982	Mainland China adopted article in constitution allowing for establishment of "special administration regions" (SARs) for Taiwan with a high degree of autonomy.
May 1983	Liao Chengzhi, the Beijing official in charge of relation with Taiwan, said that Taiwan would be allowed to purchase US weapons and join ADB after reunification.
Jun. 1983	Deng Xiaoping issued five "opinions" on unification, which included (1) After unification, Beijing would not send military or administrative personnel to Taiwan; (2) Taiwan could enjoy an independent legislative authority and it could adopt its own law; (3) Taiwan could maintain its own military so long as it felt threatened by the mainland; (4) Taiwan could maintain some rights in conducting foreign affairs; and (5) Taiwan could adopt a special flag and call itself "the Chinese Taiwan."
Jan. 1984	Deng Xiaoping proposed a "third united front" between CCP and KMT.
Feb. 1984	Deng Xiaoping told former US national security advisor Zbigniew Brzezinski that Taiwan would be allowed to practice capitalism under "one country, two systems" formula.
May 1984	Premier Zhao Ziyang proposed "one country, two system" formula as the framework of Taiwan policy for China's peaceful unification.
Jun. 1984	Deng Xiaoping elaborated on the "one country, two system" formula as meaning having socialism on the mainland and capitalism in Taiwan.

Table 3—Continued

Sources: Compiled by the author according to the data represented in Appendix:Peking-Taipei Interaction (1949-78), see Tzong-ho Bau, "Taipei-Peking Interaction as a Two-Person Conflict: A Game-Theoretical Analysis, 1949-88," *Issues and Studies*, vol. 27, no. 10 (October 1991): 90; *China Times* (Taiwan) May 23, 1990, 9; *Free China Journal*, December 17, 1990, 1.

Table 4

## Mainland China's Defection in the Second Phase

Year	Mainland China's Defection Actions/Announcements
Oct. 1982	Mainland China tested submarine-based missiles in sea north of Taiwan, which was viewed as a threat to use force against Taiwan.
Jan.1983	Mainland China requested that Taiwan should be expelled for Asian Development Bank (ADB).
Oct. 1984	Deng Xiaoping told former Japanese Prime Minister Zenko Suzuki that Beijing would never promise to renounce the use of military forces against Taiwan to reunify China.

Sources: Same as Table 3.

Table 5

## Taiwan's Defection in the Second Phase

Year	Taiwan's Defection Actions/Announcements
1979-1980	Taiwan treated mainland China's conciliatory attitude as "united front tactic" aimed at undermining Taiwan's ability to resist invasion from the mainland. Taiwan rejects mainland China's urge for "three links" and "four exchanges" by declaring "three nos" policy (no compromise, no contacts, no negotiations with mainland).
Mar.-Apr. 1981	Twelfth National Congress of ruling Kuomintang reiterated the reunification of China under Dr. Sun Yat-Sen's Three Principles of the people. Congress declares that compromise with the enemy would invite collapse.
Oct. 1981	President Chiang Ching-kuo rejected Ye's "nine opinions" proposal as being "primarily intended to stop US arms sales to our country."
Aug. 1982	Madame Chiang Kai-shek rejected Liao's suggestion for bilateral talks with a open letter.
Dec. 1982	President Chiang rejected "the special administrative region" (SAR) proposal, citing the example of Tibet.
Jul. 1983	Taiwan asserted the reunification of China was only feasible if mainland China gives up Communism and adopts Three Principles of the people.

Sources: Compiled by the author according to the data represented in Appendix: Peking-Taipei Interaction (1949-78), see Tzong-ho Bau, "Taipei-Peking Interaction as a Two-Person Conflict: A Game-Theoretical Analysis, 1949-88," *Issues and Studies*, vol. 27, no. 10 (October 1991): 91-3.

Table 6  
Taiwan's Cooperation in the Second Phase

Year	Taiwan's Cooperation Actions/Announcements
1984-1985	Taiwan allowed the growth of indirect trade (through Hong Kong) with mainland China which in 1984 exceeded US\$500 million and reached US\$840 million in the period January-October 1985.
May 1986	A China Airlines Cargo plane and two crewmen were returned to Taiwan by mainland China after negotiations in Hong Kong. Taiwan announced that it would negotiate with mainland China for humanitarian reasons.

Sources: Same as Table 5.

Certainly, the actions or announcements of mainland China were not all cooperation-oriented. That is, mainland China defected sometimes. But, these defecting actions should be viewed as threats to force and urge Taiwan to play cooperation. If so, the final payoff to the PRC would increase.

For example, in January 1983, mainland China requested that Taiwan should be expelled from Asian Development Bank (ADB). In other words, mainland China knew well that its relations with Taiwan was limited in the framework of Prisoner's Dilemma, i.e., mainland China was playing a Prisoner's Dilemma game (because it reserves the right to use force for the resolution of Taiwan issue) though it wanted to raise mutual outcomes by unilateral cooperation.

In theory, Bau provides an explanation for the shift of strategy in a Prisoner's Dilemma game. He adopts Robert Jervis's theory and Robert Axelrod's concept of "tit for tat". In fact, Jervis's theory may only be good for explaining the tendency for the players to shift their strategies from defection to cooperation under certain conditions, i.e., it can only account for the one-way shift of strategies, not the random jumping between defection and cooperation. As for "tit for tat" formula, according to its fundamental assumption--one player cooperates at the first move and goes with what the other player's choice as the following steps, its explanatory power can only extend to the games going in accordance with the assumption of "tit for tat". Then, in our case, the random shift of strategies in the PRC as well as Taiwan seems beyond its explanatory coverage. Compared to the preceding two methods, mixed strategy theory can do a better job on this. By definition, a mixed strategy can be regarded as a statement about "how many times on average a pure strategy is used." That is, it does not care about the number of changes between strategies and promises to solve the problem we mention above.

### The Solution of the Game

Up to the end of this phase, on the one hand, due to the succession problem (or power struggle) in Kuomintang after Chiang Ching-kuo's death, also because of the pressure for political reform (especially constitutional reform) from the DPP, Taiwan tended to be more cooperative in response to the PRC's good will. On the

other hand, Taiwan's security, stability, and democratic development have gradually replaced the concern for the claim of sovereignty to the mainland. To be sure, these factors, exogenous or endogenous, forced Taiwan to formulate a relatively pragmatic strategy when it developed unofficial or diplomatic relations with other countries, especially with mainland China. Besides, the melting of tension and hostility between the East and West blocs in the latter 1980s helped Taiwan to adopt a cooperative strategy to negotiate with the PRC on the differences and issues of both sides instead of military confrontation.

In short, Taiwan's unilateral transmutation in initial goals and strategies resulted in the reorganization of the game from Prisoner's Dilemma to Chicken.

#### The Premature Cooperation Phase (1987-1995)

##### The Background of the Conflict

The year, 1987 marked a turning point in Taiwan's mainland China's policy. Not until 1987 did Taiwan lift the ban that Taiwan residents could not visit their relatives on mainland. President Lee's address of May 1990 implied a change in mainland China policy:

If the Chinese Communist authorities can recognize the overall world trend and the common hope of all Chinese, implement political democracy and a free economic system, renounce the use of military force in the Taiwan Strait, and not interfere with our development of foreign relations on the basis of a one-China policy, we would be willing , on a basis of equality , to establish channels of

communication, and completely open up academic, cultural, economic, trade, scientific, and technological exchange, to lay a foundation of mutual respect, peace, and prosperity.<sup>137</sup>

In other words, Taiwan set up four conditions to talk with mainland China on reunification. They were that mainland China should: “(1) abandon its ‘four cardinal principles’ (party leadership, the socialist road, proletarian dictatorship, and Marxism-Leninism and Mao’s thought); (2) give up the option of using force against Taiwan; (3) stop isolating Taiwan in the international community; and (4) introduce a multiparty system on the mainland.”<sup>138</sup> Since Taiwan obviously understood the disadvantages of mutual confrontation, e.g., the isolation from the international community and the less chance to influence the mainland, Taiwan began to learn cooperation which guarantees to reduce tension, provide more room for its diplomatic activities, and more importantly create the opportunity to influence mainland China with democratic achievement and economic means as well.

In order to confirm its advocacy of a “one China” policy, Taiwan not only identified the reunification of China as its long-term national goal, but also established the National Unification Council in 1990 as the highest organ in charge of unification affairs. On February 23, 1991, “The Guidelines for National Unification” were formulated by the National Unification Council. The Guidelines divided the

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<sup>137</sup> Free China Journal, vol. 7, no. 37 (May 22, 1990): 3.

<sup>138</sup> Tzong-ho Bau, p. 86.

processes of unification into three stages: (1) The short term (a phase of exchange and reciprocity); (2) The medium term (a phase of mutual trust and cooperation); and (3) The long term (a phase of consultation and unification).<sup>139</sup>

In respond to mainland China's cooperative proposal, and at the same time to solve practical problems following the permission of unofficial contacts across the Taiwan Strait, Taiwan created a private government-authorized organization, so-called Straits Exchange Foundation (SEF) in 1991, which would make unofficial contact with the mainland authorities for solving conflicts, e.g., trade or fishing conflicts, between Taiwan and mainland China. Taiwan also showed its cooperation by terminating the Period of Mobilization for the Suppression of the Communist Rebellion on May 1, 1991, which marked the end of the official state of war between the Nationalists and the Communists.

In order to foster links and exchanges across the Taiwan Strait, mainland China cooperated by establishing an Association For Relations Across the Taiwan Straits (AFRATS) as a counterpart of SEF in December 1991. Mainland China hoped that AFRATS would on the one hand, resolve practical problems resulting from the opening of people-to-people exchanges, and one the other hand actively pave the way for direct negotiation between the two sides.

In April 1993, under the spotlights of hundreds of reporters, the first Koo-Wang talks was held in Singapore. This was the first time that the heads of two

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<sup>139</sup> Adopted by the National Unification Council at its third meeting on February 23, 1991, and by the Executive Yuan Council at its 2223rd meeting on March 14, 1991.

private, but government-authorized organizations from Taiwan and mainland China had met since the two parts of China were divided in late 1949. As a result, three agreements and a joint announcement were signed on April 29, 1993 between Koo Chen-fu, chairman of Straits Exchanges Foundation (SEF) and Wang Dachan, president of Association for Relations Across the Taiwan Straits (AFRATS). Koo said that “a historic step has been taken after nearly 40 years of separation,” while Wang expressed that communications and agreements are important for the continuing and enhancing development of mainland China-Taiwan relations.<sup>140</sup>

There are some major obstacles for both sides to press the reunification of China though communications like Koo-Wang talks provide a friendly environment for reciprocal exchanges. The difference between mainland China’s and Taiwan’s definition of “one China”, noted earlier, is an important obstacle. Mainland China advocates that the reunification of China should be completed under the “one country, two systems” formula. Mainland China prefers Taiwan’s status as a “special administrative region” after reunification. More importantly, the PRC strongly opposes Taiwan’s search for international identification by promoting its “flexible” diplomacy or a “one China, two governments” policy.

Taiwan, by contrast would like to be treated as an equal political entity rather than as a local government while it negotiates with mainland China. In other words,

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<sup>140</sup> Tammy C. Peng, “Historic Meeting Products Four Agreements,” Free China Journal, vol. 10, no. 31 (April 30, 1993): 1.

Taiwan insists on the sovereignty it has over the current territories and recognition of the reality of a divided China. Taiwan does not intend to challenge mainland China's sovereignty on mainland. Other obstacles such as differences in political ideology, or in way of life, also seem impossible to iron out in the near future.

For a long time, there have existed fundamental disagreements over how to treat the Taiwan issue among the political elite on the mainland. Deng Xiaoping has tended to support use of force to settle the Taiwan issue under certain contingencies. In late summer 1990, when he met with Chen Yun in the Western Hills of Beijing, Deng reportedly said:

As regards to Taiwan, we should still be prepared with the military option. There are two sets of circumstances under which we shall use force. The first one is foreign intervention. The second one is Taiwan declaring independence. It seems that now it is not very likely for foreign forces to intervene, but the danger of Taiwan declaring independence does exist.<sup>141</sup>

In comparison to Deng, Chen Yun seems to be much more disinclined in using force in regard Taiwan. After hearing Deng's statement, Chen reacted:

We should not use force abroad during the period of the Eighth Five Year Plan so as to maintain a strong financial position to develop our economic base.

As regards Taiwan, we should not adopt the military option. Such an option if taken will affect our economic development and damage our international reputation. As long as Taiwan capital comes over to the Mainland and Taiwan trades with the Mainland, gradually leading to the formation of a unified market, it will be impossible for Taiwan to

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<sup>141</sup> Weigun Gu, pp. 31-2.

become independent. Unification is only a matter of time.<sup>142</sup>

The PLA leadership in the Military Affairs Committee also tends to favor of the use of force in preventing Taiwan from realizing independence. For example, during the Gulf War of January 1991, three Communist elders led by Wang Zhen, Vice President of the PRC, recommended that the PRC should take advantage of the U.S. intervention into the Middle East to “liberate Taiwan.” However, Deng Xiaoping, Jiang Zemin, and Li Peng were opposed to this suggestion.<sup>143</sup>

In June 1995, mainland China unilaterally announced a shut-down of all channels for negotiations, e.g., the regular meeting between SEF and AFRATS, and stated this was a consequence of President Lee’s US travel. What is more, in order to force Taiwan to change its existing foreign policy, i.e., flexible diplomacy, and to undermine Lee’s prestige, mainland China held two missile exercises around the East sea, 120 miles away for Taiwan in July and August as well.

Mainland China’s dramatic change in Taiwan policy, i.e., dramatically less cooperation, really disturbed Taiwan on the eve of elections for the Legislative Yuan in December 1995, and presidential elections in March 1996.

#### The Likely Payoffs of the Game

The relations between Taiwan and the PRC can be displayed as Matrix 17

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<sup>142</sup> Ibid.

<sup>143</sup> Ibid., p. 33.

(Figure 24).

		mainland China	
		Cooperate	Defect
Taiwan	Cooperate	<p>2</p> <p>Relation normalization; Exchanges and talks Recognition increase; probably of status quo; unification under Taiwan may “one country, achieve international two sye - recognition and promote tems.” peaceful transformation on the mainland.</p> <p>2</p>	<p>1</p> <p>Force Taiwan to change “flexible diplomacy” principle; reunifi- cation, Taiwan as a local Possible disturbance govern- occurs; Taiwan may ment. succumb to mainland’s threats.</p> <p>3</p>
	Defect	<p>3</p> <p>Mainland China is influ- enced by Taiwan. collapse of Comm- Reunification unist regime; under “one China, Taiwan inde- two governments”; pendance Mainland China is transformed into democracy peacefully.</p> <p>3</p>	<p>4</p> <p>Tension raises; economic development retarded; Tension probably military between both conflicts and sides raises; international Taiwan isolated interven- further; probably tion. military confrontation.</p> <p>4</p>

Figure 24. Matrix 17: The Premature Cooperation Phase.

The mainland China-Taiwan relations up to the third phase witnessed a dramatic transformation, i.e., in game-theoretical term the framework for mutual interactions had transmuted from Prisoner's Dilemma to Chicken. Compared to the

actions of the players in Prisoner's Dilemma, both sides tended to adopt cooperation more than defection in Chicken. It is possible to reach a binding agreement (cooperative pair) which guaranteed both sides to procure the second best payoff in the game. According to Matrix 17, through mutual cooperation, Taiwan may gradually achieve sufficient "international space" or recognition for the best result. Also, Taiwan may dedicate to peaceful transformation on the mainland by economic means and political propaganda for democracy. From the perspective of mainland China, rapprochement with Taiwan may allow it to take advantage of Taiwan's financial strength and human resources for the economic reform and development. In addition, mainland China can encourage Taiwan to accept Deng Xiaoping's proposal-the reunification of China under "one China, two systems" framework.

#### The Players' Preference Orderings and Strategies

To Taiwan, the outcome of defection (DD) is evaluated as the worse of all possible payoffs. In other words, Taiwan as a rational actor would like to temporarily succumb to mainland China's requirement, e.g., to change the current policy or to reaffirm the attitude to "one China" principle, rather than go back the military confrontation or invite the possible outbreak of war. By contrast, mainland China as a stronger competitor can bear the losses due to being double crossed. Therefore, it is highly possible for mainland China to cooperate on the surface (in words) and to defect in reality. Even so, it is irrational for the PRC to launch military campaigns

against Taiwan. According to the PRC's self-evaluation, the cost for the taking Taiwan by force would be around US \$200 billion, but taking Taiwan would earn \$120 billion in return; that is, the net loss to the PRC in a successful military action to take Taiwan would be \$80 billion. It also estimated that the PRC would lose 1,500 aircraft and suffer 3 million casualties.<sup>144</sup>

Besides, the U.S. expected intervention into Taiwan issue still shadowed the PRC's resolution to launch any military action though the PRC realized that the U.S. is eager to need the cooperation of China in global events. According to the analysis of National Bureau of Asian and Soviet Research, the PRC plays a significant role which favors the U.S. interests, e.g., it has contributed to the international isolation of Iraq, made critical efforts to compel the Khmer Ronge to accept the emerging Cambodian political settlement, normalized relations with Indonesia, and put forward an essential proposal for shelving conflicting sovereignty claims to the islands of the South China sea and promoting joint exploitations of the natural resources in the vicinity of these islands.<sup>145</sup> Obviously, the United States tries its best to avoid involving into the dilemma, i.e., to choose either the PRC or Taiwan. In tradition, the United States strongly supports Taiwan to adhere to the way of capitalism and democratic development. Although there is no governmental relations between both

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<sup>144</sup> Ibid., p. 35.

<sup>145</sup> Robert Ross, "American China Policy and the Security of Asia," National Bureau of Asian and Soviet Research, NBR analysis 1, no. 3 (December 1990): 31.

countries, the Taiwan Relations Act binds both together in many perspectives. By contrast, the Sino-U.S. relations are based on three joint communiques in which the U.S. recognizes that Taiwan is part of China and the PRC has given its word to solve Taiwan issue in peaceful means. To be sure, the U.S. attitudes in the future would directly or indirectly affect the PRC and Taiwan in choosing the strategy to deal with each other.

The data with respect to the interaction between mainland China and Taiwan for this phase are displayed in Tables 7, 8, 9, and 10.

Table 7

## Taiwan's Cooperation in the Third Phase

Year	Taiwan's Cooperation Actions/Announcements
Jul. 1987	Taiwan lift the ban on tourist trips to Hong Kong and Macao, and allows reprinting and sale of selected nonpolitical mainland academic publications.
Jul. 1987	Taiwan allowed mainland medicinal herbs to be directly imported through Hong Kong.
Sep. 1987	Taiwan allowed Taiwan residents to visit their relatives on mainland.
Mar. 1988	Premier Yu Guohua noted that Taiwan may adjust the current "three nos" principle if mainland China renounced the use of force against Taiwan, the "four cardinal principles," and "one country, two systems" formula.
	Taiwan claimed that it may reconsider policy on direct shipping, mail,

Table 7—Continued

Year	Taiwan's Cooperation Actions/Announcements
	and air transportation links.
Jul. 1988	<p data-bbox="412 495 1332 580">Taiwan drew up draft regulation for dealing with mainland's application to attend funerals in Taiwan.</p> <p data-bbox="412 644 1332 772">President Lee Teng-hui claimed that Taiwan may adjust "three nos" policy if mainland China would stop isolating Taiwan in the international community.</p>
Aug. 1988	<p data-bbox="412 836 1332 1011">Taiwan considered lifting the ban on news reporting about mainland and plans to allow low-ranking public employees to visit mainland. The Mainland Affairs Task Force was established by the Executive Yuan, with Vice premier Shih Chi-Yang as Convener.</p>
Sep. 1988	<p data-bbox="412 1076 1332 1152">Taiwan relaxed restriction on mainlanders visiting sick relatives in Taiwan.</p> <p data-bbox="412 1217 1332 1293">Taiwan lift the ban on attendance at international nongovernmental conferences and participation in sporting events on mainland.</p>
Oct. 1988	<p data-bbox="412 1358 1332 1434">KMT decided in principle to allow mainland students studying abroad to visit Taiwan.</p> <p data-bbox="412 1499 1332 1681">Taiwan high court ruled that direct trade with mainland is no "rebellion." Taiwan allows mainlanders to inherit property of relatives in Taiwan and permits Taiwan residents who give birth or get married on mainland to obtain a birth or marriage certificate in Taiwan.</p>

Table 7—Continued

Year	Taiwan's Cooperation Actions/Announcements
Mar. 1990	President Lee Teng-hui said that he opposed Taiwan independence.
Oct. 1990	The National Unification Council was established under the Presidential Office; the Mainland Affairs Council was established by the executive Yuan.
Feb. 1991	Taiwan formulated the Guidelines for National Unification. Taiwan establishes private and government-authorized "Straits Exchange Foundation." (SEF)
May 1991	Taiwan put an end on the "Period of Mobilization for Suppression of the Communist Rebellion."
Dec. 1991	Taiwan allowed mainland-Taiwan couples who has married for two years to apply for residence in Taiwan.
Mar. 1992	Taiwan allowed mainland antiques to be exhibited in Taiwan's galleries.
Apr. 1993	Taiwan allowed banks to contact with mainland financial institutions and establishes branches on mainland.
May 1993	Taiwan welcomed mainland outstanding scientists to visit or cooperate with Taiwan's research institutions for certain projects.
Jun. 1995	Taiwan reiterated that it would stick to "one China" principle and enhances the unification of China.

Table 7—Continued

Sources: Compiled by the author according to the data represented in Appendix: Peking-Taipei Interaction (1949-78), see Tzong-ho Bau, "Taipei-Peking Interaction as a Two-Person Conflict: A Game-Theoretical Analysis, 1949-88," *Issues and Studies*, vol. 27, no. 10 (October 1991): 93-5; *Free China Review*, vol. 41, no. 1 (January 1991): 15; Tasi Cheng-Wen & Lin Chia-Cheng, *Political relations across the Taiwan Straits* (Taipei: Insitute for National Policy Research, 1989); *Free China Journal* (May 7, 1991): 1-2; (July 23, 1991): 6; (August 23, 1991): 1; *Across-Straits Relations Explanation*, (Taipei: Mainland Affairs Council, 1994), pp. 203-225.

Table 8

## Taiwan's Defection in the Third Phase

Year	Taiwan's Defection Actions/Announcements
Dec. 1987	President Chiang Ching-Kuo in interview with <i>Global Views</i> claimed that reunification is only possible under Three Principles of the People.
Jul. 1988	President Lee Teng-hui indicated that Taiwan must adhere to "three nos" for time being to deal with mainland China's united front policy.
Sep. 1988	KMT expelled legislator Hu Chiuyan for contacting top officials during visit on mainland.
May 1989	Taiwan approved the "Measures to Support the Democracy Movement on the Mainland."
May 1990	President Lee Teng-hui claimed that talks must be carried out on an equal government-to-government basis, not between the KMT and the CCP.

Table 8—Continued

Year	Taiwan's Defection Actions/Announcements
Dec. 1990	Chu Chi-Ying, Direct of the KMT's Department of Cultural Affairs, rejected mainland China's suggestion to hold high and low-level "party-to-party" talks in Taiwan on bilateral relations and reunification under "one country, two systems" framework.

Sources: Compiled by the author according to the data represented in Appendix: Peking-Taipei Interaction (1949-78), see Tzong-ho Bau, "Taipei-Peking Interaction as a Two-Person Conflict: A Game-Theoretical Analysis, 1949-88," *Issues and Studies*, vol. 27, no. 10 (October 1991): 93-5; *Free China Review*, vol. 41, no. 1 (January 1991): 15; Tasi Cheng-Wen & Lin Chia-Cheng, *Political relations across the Taiwan Straits* (Taipei: Institute for National Policy Research, 1989); *Free China Journal* (May 7, 1991): 1-2; (July 23, 1991): 6; (August 23, 1991): 1.

Table 9

## Mainland China's Cooperation in the Third Phase

Year	Mainland China's Cooperation Actions/Announcements
Jun. 1988	Mainland China announced regulations on cross-Strait marriages.
Jul. 1988	Mainland China started campaign to study Taiwan's law. Mainland China claimed that it wishes to discuss possible new constitution and conditions for renouncing reunification by force with Taiwan.
Aug. 1988	Mainland China's supreme court ruled that people in Taiwan have

Table 9—Continued

Year	Mainland China's Cooperation Actions/Announcements
	same right to inherit property as mainlanders and issues set of principles for dealing with cross-Straits bigamy and remarriage.
Sep. 1988	Hong Kong press reported that mainland China is ready to establish a body for dealing with cross-Straits trade issues which could help increase benefits of both sides.
Jul. 1989	Jiang Zhemín, CCP general secretary, reaffirmed the "one country, two systems" formula and reassured that mainland China would not impose the socialist system on Hong Kong and Taiwan.
Jan. 1991	Yang Shangku <sup>n</sup> , National <sup>Chairman</sup> Chiefman, urged talks between the CCP and the KMT.
Dec. 1991	Mainland China established Association For Relations Across the Taiwan Straits (AFRATS).

Sources: Compiled by the author according to the data represented in Appendix: Peking-Taipei Interaction (1949-78), see Tzong-ho Bau, "Taipei-Peking Interaction as a Two-Person Conflict: A Game-Theoretical Analysis, 1949-88," *Issues and Studies*, vol. 27, no. 10 (October 1991): 93-5; *China Times* (Taiwan), May 23, 1990, 9; *Free China Journal*, December 17, 1990, 1; *Cheng Ming* (Hong Kong), September 1991, 5.

Table 10  
Mainland China's Defection in the Third Phase

Year	Mainland China's Defection Actions/Announcements
Dec. 1987	Mainland China revised its 1979 "War Plan to Liberate Taiwan" to include the possibility of using force to get Taiwan to the negotiating table should the prospects of talks look bleak.
Jan. 1988	Mainland China asked mainland people to beware of ideological contamination by visitors from Taiwan.
Jan.-Jun. 1988	Mainland China held military exercises in South China sea aimed at training its troops in island warfare.
Feb. 1991	Mainland China reiterated that it would not recognize Taiwan as a political entity.
Jun. 1995	Mainland China shut down the regular meetings between SFRATS and SEF.
Jul. 1995	Mainland China held the First round missile exercises around the East sea from July 21 to 28.
Aug. 1995	Mainland China launched the Second round missile exercises around the East sea from August 15 to 25.
Sep. 1995	Jiang Zemin noted that the Chinese Communist Party and the government of People's Republic of China strongly insist on maintaining the sovereignty and the integrity of territory by all means.
Oct. 1995	Qian Qichen stated that Chinese affairs do not need the mediation for a third party, the contact between political leaders from both sides does

Table 10—Continued

Year	Mainland China's Defection Actions/Announcements
	not need an international conference.
Oct. 1995	Jiang Zhemín noted "if separatism emerges on Taiwan, whether stemming from international hostile forces or from local separatist forces, then we might use nonpeaceful means to achieve reunification."

Sources: Compiled by the author according to the data represented in Appendix: Peking-Taipei Interaction (1987-88), see Tzong-ho Bau, "Taipei-Peking Interaction as a Two-Person Conflict: A Game-Theoretical Analysis, 1949-88," *Issues and Studies*, vol. 27, no. 10 (October 1991): 93-5; *China Post*, *Free Times* (Taiwan), July 20, August 14, September 4, 1995; *Central Daily News* (Taiwan), October 2, 16, 1995.

To be sure, Table 7 indicates Taiwan's resolution to cooperate with mainland China though the scope of contact in practice is limited to nongovernmental and nonpolitical affairs. Besides, Taiwan intention to participate in the international community is strong and obvious, e.g., President Lee's American travel. In contrast to mainland China's constant position on "one China," Taiwan tends to not be constrained by it in order to struggle for more advantages in economic or political arena from international community. Due to the implementation of four modernization and the rapid economic growth, mainland China can not help

maintaining friendly and peaceful environment in order to attract more investments from Taiwan as well as other countries; but on the other hand, it adopts hard line about the “Taiwan issue,” that is, it would give in any possible challenge to the sovereignty of “one China.”

Tables 9 and 10 may back up our inference. Mainland China urges Taiwan to exchange and talk, on the one hand; and it confirms its hard line about the “Taiwan issue,” on the other hand. Put it another way, mainland China is eager to cooperate with Taiwan or other nations as to economic or even political affairs which have nothing to do with the sovereignty of China because it knows well that cooperation may not only create a beneficial situation for Chinese Modernization in the short-term but also enhance the opportunity for the peaceful reunification of China in the long-term.

### The Solution of the Game

Since Taiwan made security its top priority, it would tend to concede the PRC’s political or military threats on specific issues ( e.g., the movement of Taiwan independence) to a certain degree. However, Taiwan would and could play defection on certain concerns like the pursuit of international space which would promote Taiwan’s prosperity and the welfare of twenty-one million Taiwan residents in the future when it got the outside help like the support from the United States.

In contrast, the goals set in the 1980s, especially the reinforcement of four modernizations and the solution of the Taiwan issue, continue occupying the PRC’s

agenda for the 1990s. For the economic reform's sake, the PRC would stick to cooperate with the business community of Taiwan to achieve necessary economic resources, e.g., investments, management skills, and high technologies. However, observed from the political perspective, the PRC's attitude toward Taiwan is ambiguous. On the one hand, the PRC not just continues to request for enlarging the scope of exchanges but to propose the peaceful reunification under the framework of "one china, two systems" as well. But, on the other hand, the PRC still adopts a strong position regarding the solution of the Taiwan issue. For example, by aggressive means like missile excises, the PRC intended to depress Taiwan while it suspected that Taiwan may attempt to create the image about "one China, one Taiwan" or "two Chinas" and finally lead the way to independence by so-called "pragmatic diplomacy." In other words, in this Chicken game, the PRC obviously chose a mixed strategy because it believed that the relatively maximum expected payoff would be ensured, i.e., Taiwan would maintain close relations with the PRC, especially in economic perspective; and at the same time, the likelihood of Taiwan independence would be eliminated.

Up to the end of this phase, for the security sake, Taiwan has made some concessions to the PRC's political extortions following the threats of military maneuver. For example, to reduce the PRC's suspicion regarding the intention of Taiwan independence, Koumintang took advantage of all available occasions, national or international, continuously reclaimed that the reunification of China in the

long run in peaceful means is the terminal goal of Taiwan democratic development. Besides, in order not to provoke the PRC, Taiwan is in self-restraint and cautious in dealing with the maintenance and development of diplomatic relations with other countries. On the other hand, Taiwan is eager to strive for international supports to protest against the PRC's threat-oriented missile tests which would not only affect Taiwan's stability and security but also cause the needless panic and intention around the west Pacific rim.

Since the PRC's position is relatively superior to Taiwan's in such a Chicken game, it would adhere to a mixed strategy (probably increase the number of adopting defection) for sure. Reportedly, the political leaders on the mainland are moving toward a Taiwan policy of "the threat of the use of force" coupled with the offer of economic advantage to the business community in Taiwan.<sup>146</sup> By contrast, Taiwan may be contained to play more cooperation under the PRC's pressure. Or, Taiwan may begin to play firm to a certain extent only when it achieves outside help like the U.S. commitment. If so, then the construction of the game would change from Chicken back to Prisoner's Dilemma. That is, due to the increasing of political resources, Taiwan may prefer to play Prisoner's Dilemma rather than Chicken when it gradually recognizes that the payoff from defection would outweigh that from unilateral cooperation or capitulation.

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<sup>146</sup> R. L. Chen, "Beijing Announces New Tests," China Post (Taiwan), August 11, 1995.

## Conclusion

In this chapter, mainland China-Taiwan relations over the past years are divided into three phases: (1) the military confrontation phase (1949-1978); (2) the peaceful competition phase (1979-86); and (3) the premature cooperation phase (1987-1995). We adopt Bau's models, Deadlock and Prisoner's Dilemma, as the basic frameworks for analyzing the interactions between both sides in the first and second phases. Two major shortcomings within Bau's models are pinpointed as follows: (1) Bau takes advantage of different models to deal with the relations under the individual phases, but he does not provide any credible evidence from the theory perspective to explain why and how he can shift game models from one to another; and (2) Bau adopts Axelrod's concept of "Tit for Tat" to explain the policymakers' decision to alter their strategies from defection to cooperation and vice versa during the game. In fact, the concept of mixed strategies is superior to "Tit for Tat" in answering the strategy-shifting question.

The long-run interactions between mainland China and Taiwan witnessed the players' dramatic change in primary goals, attitudes, and strategies in correspondence with the interactions of external and internal factors. For example, in decades, Taiwan called for the counterattack of the mainland and competed with the PRC for the sovereignty of China in the international arena; but since the aftermath of Lee Teng-hui's succession to Chiang Chin-kuo in 1988, Taiwan tended to pay more emphases on its national security and economic development instead on the struggle for the

sovereignty of China with the PRC. To capture the transformation on initial goals as well as strategies, except adopting Bau's models, we formulate Chicken as the fundamental structure for describing the relations in the third phase.

One of the significant findings in our analyses is that we recognize the likely influence exerted by the potential third party like the U.S. and the U.S.S.R on the policymakers in both sides. Under the framework of two-by-two models, the U.S. or the U.S.S.R. is treated as an ally to Taiwan or mainland China. In other words, we take their possible leverage into account as one of exogenous factors to the policymakers of both sides.

Through applying two major game theoretical hypotheses such as: (1) the more opportunity for the players to communicate prior to or during a game, the more likelihood for them to cooperate with one another; (2) compared to Prisoner's Dilemma, Chicken is more conducive to cooperation, we have generated a particular hypothesis, i.e., Chicken is more suitable than Prisoner's Dilemma in explaining mainland China-Taiwan relations in the post-Cold War era. On the other hand, conducting our descriptions and analyses based on the analyses of historical events and data, in this chapter to some extent we have explained and inferred what strategies were adopted by mainland China and Taiwan, and why and how strategies change in long-run interactions.

## CHAPTER VI

### CONCLUSION

#### Summary

The primary design of this study had the goal of examining the capacity of game theory (especially game-theoretical models) to help in the analysis of international crises. Based on the significant characteristics of game models, one objective was to generate a few testable hypotheses that could contribute to our understanding of game theory and allow us to analyze mainland China-Taiwan relations from the perspectives of interest conflict not merely from the descriptions of documentary data. It is assumed that we can achieve the ostensible objectives when we are familiar with the crucial assumptions and characteristics of game theory and the applications of game models to a given conflict situation.

While managing this case study, I tried to formulate a practical approach (or so-called dynamic model) to decode a complicated long-term conflict like mainland China-Taiwan relations based on the random mixture of game models. Simply speaking, this experiment may help rectify a dominant and stubborn image concerning game theory: Game theorists are liable to choose one specific model (Prisoner's Dilemma or Chicken) to explain a given conflict—in other words, no matter what the conflict, the period of time does not matter to the applications of

game models. In this thesis, the point is made that as time goes by due to the interactions of internal or external factors, the structure of the game may be transmuted by the players' initial goals. If so, the combination of multi-models as a comparative approach would be much more capable in dealing with the evolution of a given conflict than one specific model. In addition, the definitions of cooperation and defection made by Bau as well as Snyder are adopted as the major criteria for classifying and analyzing history events and relevant data, though we realize the reality of diplomatic options is difficult to be examined by a simple two-poles continuous (cooperation and defection) scale.

In Chapter II, game theory is defined as an approach to analyze the problem of strategy selection in conflict situations where strategies are interdependent. Two crucial elements, the concept of rationality and expected utility theory, are exposed and discussed in detail. Since game theory is viewed as a type of the rational choice approach, I have clarified the close association between them. By comparison, game theory shares the similar assumptions with the rational choice approach and conveys itself into a relatively integral theory. For example, the rational choice approach assumes that an actor will behave based of his own preference orderings. In addition, it takes advantage of rationality as "a behavior statement" which takes "the goals of an individual as given ." Rational choice theory does not attempt to decide whether the goals are rational or not and explain where individual preferences come from. It does "describes how those goals would be attained efficiently and stipulates a

consistency between preferences and actions.”<sup>147</sup> The difference between the rational choice theory and game theory is that the latter pays high attention to how a rational actor attains his initial goals under a given situation, especially through concise and well-constructed game models. More important, game theory concentrates on dealing with strategic situations in which the actors’ strategies are interdependent.

In Chapter III, the study moved from the essential assumptions and concepts of game theory to two kinds of game-theoretical models: zero-sum games and non-zero-sum games. First, we identify the Deadlock game model as a general type of zero-sum game. We describe some characteristics of Deadlock as: (a) the players are totally interest-conflicting among themselves; (b) each player has his own dominant strategy with which neither player can force the other to accept the unequal payoff, the best for one and the worst for the other; (c) due to the lack of mutual interest, the payoff of defection is better than that of cooperation. Next, I introduce and compare two well-known non-zero-sum game models, Prisoner’s Dilemma and Chicken. In general, these game models share two common features: (1) there exist conflict and mutual interest among the players; (2) cooperation guarantees a higher payoff than defection. The players in a Prisoner’s Dilemma game find it easier to identify a dominant strategy that may ensure the second worse payoffs than others in a Chicken game. However, due to the lack of mutual trust, it is difficult to reach a

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<sup>147</sup> David Lalman, Joe Oppenheimer, and Piotr Swistak, “Formal Rational Choice Theory: A Cumulative Science of Politics,” Political Science: The State of the Discipline II, Ada w. Finifter, ed. (Washington, DC: the American Political Science Association Press, 1993), p. 79.

binding agreement (or a stable equilibrium) among the players in Prisoner's Dilemma. By contrast, it seems possible to encourage or compel the players to cooperate with one another in Chicken because the players tend to avoid the crash result. Several likely solutions to game models are mentioned in the final part of this chapter. The "tit for tat" strategy and mixed strategies by which we try to explain why and how the players shift their strategies in an iterated game.

In Chapter IV, to evaluate the capacity of game models in dealing with international conflicts, we reviewed three previous case studies: the Southwest Pacific Conflict of 1943, the Berlin Crisis of 1958-60, and Cuban Missile Crisis of 1962. Through analyses and comparisons, we showed that the characteristics and explanatory power of a certain type of game model are suitable for a specific conflict, e.g., the decision-makers' goals and reactions during Cuban Missile Crisis of 1962 are better explained in terms of Chicken than Prisoner's Dilemma.

In Chapter V, the evolution of mainland China-Taiwan relations is separated into three phases: (1) the military confrontation phase (1949-1978); (2) the peaceful competition phase (1979-86); and (3) the premature cooperation phase (1987-1995). To meet the different feature of each phase, we assign Deadlock as the basic framework of analyses for the first phase, Prisoner's Dilemma for the second phase, and Chicken for the last phase.

This arrangement alludes to the game that would transform from one specific type to another when the players, unilaterally or jointly, alter their expected goals,

preference orderings, and strategies by the changes of exogenous and endogenous factors. For example, due to the diplomatic victory in the 1970s, also because of the launching of economic reform under the leadership of Deng Xiaoping, the PRC began to play a Prisoner's Dilemma game instead of a Deadlock game after 1979. The change of strategies in mainland China directly caused the reorganization of payoff matrixes, on the other hand, tempted Taiwan to adjust its strategies and preference ordering for the sake of maximizing self-interest. Also, we point out that two contrasting concepts should be taken into account, the subjective recognition of the players and the objective constraint of the situation, when we choose a game model for a given situation.

During our analysis, we observe that Taiwan's national priority shifted dramatically. In the very beginning of military confrontation stage, Taiwan insisted on competing with mainland China for the right to represent China in the international community. Up to 1994 the government on Taiwan announced that Taiwan would no longer challenge the PRC's sovereignty in the mainland . In other words, since the aftermath of President Lee's succession to Chiang Chin-kuo in 1988, rather than stick to the struggle for the sovereignty of China in the international arena, Taiwan was inclined to emphasize its economic development and national security.

The possible influence and intervention exerted by the U.S. and the U.S.S.R. on the policy making procedures of both sides over time were considered, so that it would meet our desires to analyze the strategic interdependence between mainland

China and Taiwan under the framework of game models. Based on the analyses of historical events and data, we suggest several hypotheses: (a) the more opportunity for the players to communicate before or during a game, the greater the likelihood that they will cooperate with one another; (b) compared to Prisoner's Dilemma, Chicken is more conducive to cooperation; and (c) Chicken is more suitable than Prisoner's Dilemma in explaining mainland China-Taiwan relations in the post-Cold War era.

### Limitations and Advantages of Game Theory

Overall, game-theoretical models were criticized as too simple to display all the complexity of social phenomena. For example, Mckelvey and Rosenthal argue that although game theory has had a substantial impact upon political science at the "conceptual level," only rarely has it led to "rigorous empirical analysis of real world behavior."<sup>148</sup> Such a critique obviously refers to the problem of the scope of applying game theory. They set the scope of applications according to the definition of game theory. That is, game theory is applicable to situations in which the players are assumed to be rational and able to make decisions based on their own preference orderings. More explicitly, whether the scope of applications is narrow (or wide) depends on the relevant assumptions, axioms, and hypotheses organized and developed in the theory. In general, the rational choice theory, with a wide scope of

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<sup>148</sup> Richard D. Mckelvey and Howard Rosenthal, Coalition Formation, "Policy Distance, and the Theory of Games Without Side Payments: An Application to the French Apparentment System," Game Theory and Political Science, Peter C. Ordeshook, ed. (New York: New York University Press, 1978), pp. 405-406.

applications, explains diverse human behavior by means of simple assumptions-- individuals are rational in nature and would behave rationally to pursue optimal outcomes. In contrast, game theory set up a relatively narrow scope. The scope is restrained based on the following assumptions: (a) their personal preferences lead the rational players, i.e., they are supposed to adopt the action that not only would meet their preference orderings but also increase the expected utility in return; and (b) the players' strategies are interdependent, i.e., the payoffs are decided by the interactions among players' choices. Under such assumptions, game theory may define rationality as an integral and effective connection between means and goals. And, the function of game theory lies in explaining and predicting how the actors behave rationally.

Typically, psychological or dispositional approaches are required to answer questions such as: Why does an individual have a specific preference ordering? How does tradition (or culture) influence individual behavior in a certain way? Game theory does other things in comparison to cultural approaches. Simply speaking, game theory places high emphasis on the choices or responses of a rational actor under a given conflict circumstance in which the actors' decisions are interdependent. In other words, since individual preferences can be changed under certain conditions, game theorists believe that it is not the responsibility of game theory to trace the origins of a specific preference (or goal) and prove one preference over the other. As for personal preferences, game theorists are likely to highlight that rational actors should and could be better off if they follow their personal preferences.

To be sure, psychological approaches could provide other perspectives regarding the similar issue which game theory addresses. For example, Johnston formulates the theory of “strategic culture” to clarify and analyze the relationship between contemporary Chinese strategic principles and actions. He contends that Chinese strategic culture nourished by ancient traditions in philosophy and statecraft is substantially different from what are portrayed as Western traditions. Through the analysis of strategic culture, he addresses the following question: To what extent has this strategic culture affected upon decision-makers’ choices, accommodation, defense, or offense, when China is confronted with external “threats”. In other words, according to the concept “strategic culture”, Johnston argues that a state’s strategic behavior is less responsive to others’ choices and a certain decision is made under a certain situation in which decision-makers share similar ideology. He notes that the concept of strategy interdependence does not root deeply in the policy makers’ mind in contrast to the concept of strategic culture. To be sure, a theory like strategic culture would easily draw our attention to related topics such as the nature of conflict in human affairs, the nature of the enemy, and the efficacy of violence. However, its weakness lies in the difficulty in identifying the dependent and independent variables when we try to confirm the relevant elements for strategic culture and the interactions between strategic culture and political elites.<sup>149</sup> Moreover, the model of strategic

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<sup>149</sup> Alstair Iain Johnston, Cultural Realism: Strategic Culture and Grand Strategy in Chinese History (Princeton, New Jersey: Princeton University Press, 1995).

culture may fail to highlight the importance of interdependent relations among participants. In contrast to psychological approaches or strategic cultural theory, game theory is relatively weak in its ability to cover the variety of elements related to a conflict situation, such as individual differences, leaderships, traditions, socioeconomic constraints, and the like. This fact implies that the capacity of game theory in explaining conflict might decline when more actors and options get involved in the structure of the game. To be sure, this is the limitation of game theory. However, on the other hand, the characteristics of game theory (e.g., the assumptions of rational actors, clear-cut choices, and expected payoffs) really allow us to clarify, in Axelrod's words, "some of the subtle features of the interaction [especially among goals, actions, and results]—features which might otherwise be lost in the maze of complexity of the highly particular circumstances."

Binmore argues that game theorists in particular are ready to provide advice on two distinct types of problem. The first suggestion is related to the concern of "how best to play a given game." The second one is to determine the nature of the game to be played with a view to ensuring that "its play will not lead to socially undesirable outcomes," which conflict with the objectives of those for whom the game is designed. The former refers to the players' consideration on choosing a relatively better strategy to interact with one another during the game. By contrast, the latter points out the importance of the assumption--the players are rational in the game.<sup>150</sup>

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<sup>150</sup> Ken Binmore, p. 35.

In his autobiography-like introduction with respect to the entry and application of game theory in political science, Riker recognizes two fundamental features of game theory. First, he notes that game theory reflects and corresponds to the uncompromising rationalism existing in the real world. Unlike other approaches obviously targeting events or phenomena as the subjects for discussion, game theory gives attention to rational people who are eager to achieve personal goals. To be sure, probably due to the preference difference and the choices of strategies among the players, game theory cannot guarantee that each player's choice would result in the attainment of the preferred goals, according to the structure of the game, because the players' actions affected each other in determining the outcome. In other words, rational players adopting rational means in pursuit of preferred outcomes might end with an irrational consequence. Second, Riker argues game theory shows the significance of free choice to some extent, though the number of choices may be constrained by a given conflict situation, i.e., the structure of the game. In general, Game theory suggests that the players, knowing their preferences, estimate how alternative strategies might satisfy those preferences. Also, game theory says that the outcomes would directly derive from individual choices and the interactions among them--not from some exogenous plan for the world, not on some built-in irrational propensity, just on free human choice. What Riker wants to say is that the most important contribution of game theory to political science is its allowance for "generalization about human choice in a way that admits of more or less precise

determination of the form of human goals in particular social circumstances (the structure of the game).“<sup>151</sup>

In Snyder's words, the primary advantage of game-theoretical models (especially two-by-two games) lies in its concise description of “the basic structure of the crisis situation,” i.e., the game. In short, to behave rationally in game theory means that the players as competitors are expected to act to maximize by all means the achievement of their own postulated goals. The outcome depends not only on chance but also on the actions of other players, sometimes conflicting and sometimes cooperative.<sup>152</sup>

#### The Possibility for Constructing a Dynamic Game Model

Typically, facing a historical event or an ongoing conflict situation, game theorists usually apply a single game model to explain and predict the players' preference orderings, strategies, and the likely payoffs. To be sure, the Prisoner's Dilemma is a favorite model because it promises to simplify complicated conflict into succinct strategy interactions among the players by means of easily understood framework, especially with a two-by-two formula.

Through the application of the Prisoner's Dilemma game theorists can (at the

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<sup>151</sup> William H. Riker, “The Entry of Game Theory into Political Science,” Toward a History of Game Theory, E. Roy Weintranb, ed. (Durham and London: Duke University Press, 1992), pp. 209-11.

<sup>152</sup> Steven J. Brams, Game Theory and Politics (New York: The Free Press, 1975), p. 15.

first stage) recognize the players' preference orderings, the strategies open to the players, and the likely payoffs assigned to the players. Then, they can analyze a couple of variations for the strategy combination. Game theorists may take advantage of the characteristics of Prisoner's Dilemma to explain why and how a rational actor should or could do, not only in accordance with his preference orderings but also under the constraint of the game. For example, they may suggest that the consequence of DD would be a relatively determined outcome in a Prisoner's Dilemma game because the players lack of mutual trust; thus making a binding agreement which promises to increase the expected payoff for the players is impossible.

The application of a static model to a given situation in principle allows the researchers to quickly highlight the critical part of a conflict, e.g., who the actors are, what the actors want, and what they can do to achieve their initial goals with the lowest cost. Also, the researchers can take advantage of a single model to capture the conflict to the extent in which some key factors are scrutinized by abandoning secondary materials. Besides, in this way, game theorists could offer a couple of dominant predictions regarding the further evolution of the situation.

Of course, game theorists assume that the situation they are addressing should and would be contained under the framework of a reiterated game. That is, a conflict may last a period of time, not just happen in a brief moment. Those who apply a single model to a long-run conflict, may encounter a significant critique. Such critiques could include: As time goes by, how can we use only one model to explain

the players' changes in goals and strategies while their preference orderings and the assigned payoffs are transmuted in association with the transformations of endogenous and exogenous factors in the game? In addition, game theorists assume that the players are viewed as equal competitors in a game. What will happen if the players are not equal? Is there any game model which can fit such a variation? Could it be possible that one player will play Chicken while the others are flexible enough to play Prisoner's Dilemma or Chicken in a game? If so, what would this game look like?

Obviously, it seems beyond the explanatory power of a single model to solve these two fundamental problems. To solve this problem, Bau takes the first experiment in which he uses three models (seriously speaking two, Deadlock and Prisoner's Dilemma) to decode the complex and continuous Taiwan/PRC relations, though he does not explicitly account for why the models are shifting over time. His approach is unlike other game theorists who merely adopt one "dominant" model, e.g., Prisoner's Dilemma to analyze general international crises.

To bridge the gap between the shift of model and the dynamic relations, in the preceding chapter I provide explanations for why we separate the relations into three phases and why certain type of model is assigned to a selected phase. For example, one of the reasons for our assigning Chicken as the basic framework for the explanation of mainland China-Taiwan relations in the third phase is compared to Prisoner's Dilemma, Chicken is much more conducive to promote a binding

agreement for cooperation on both sides because of costly penalties (or negative payoffs) like war, but also that Taiwan is liable to follow the cooperative strategy (although sometimes it pretends to play Prisoner's Dilemma , i.e., stick to defecting strategy) because of lack of political resources and the consideration of security as alike.

To this point, this case study has examined the hypothesis (based on the mixture of two concepts, i.e., the players' subjective recognition in the game and the objective constraint of the conflict situation): the game should and could be identified as Chicken when one player plays Chicken despite other players' strategy, either cooperation or defection.

Such a dynamic multi-game model approach may solve some problems related to game theory to a certain degree. However, it also leaves problems for further resolution. For example, it may be that we cannot totally capture the real conflict situation by means of three types of game models (other models may be needed). Also, three classic game models under the two-by-two framework in nature are short of the capacity to successfully deal with the influence import on the players of a potential third party over the players. In short, we may need to formulate a sub-game model to cope with the relations among allies when we apply a multi-game model to expose the interactions between the major players.

### The Prospect of Mainland China-Taiwan Relations

From late 1995, the PRC conspicuously has taken a series of aggressive

actions toward Taiwan. These defecting activities, including three rounds of missile exercises and a large-scale military maneuver were conducted during the aftermath of President Lee's American Trip and before the Taiwan presidential elections on March 23, 1996. What does mainland China hope to achieve? Why the new defection instead of cooperation? Will the strategy backfire?

According to Lin Chung-pin, a professor at Georgetown University and a specialist in mainland China's military strategy, the missile exercise is probably the latest in a string of psychological warfare tactics aimed at inciting fear and exploiting difference between rival groups within Taiwan.<sup>153</sup> Under the shadow of the likelihood of Taiwan independence, the PRC held missile exercises in pursuit of multi-political goals. In the short run, it is believed that the major propose of these military maneuvers lay in affecting the result of the presidential election.

Through military threats, mainland China also hoped to depress the advocacy of Taiwan independence and back up the presidential candidate LinYang-kang who claims to modify the so-called pragmatic diplomacy to soothe the PRC's hostility. According to the PRC's evaluation, although Lin may lose in the election, he can influence the vote for Lee, i.e., it is expected to go below 50% of the total voting. In the end, it may affect Lee's attitude and position toward the PRC. That is, when the occasion comes for contact and negotiation between political leaders from both sides, Lee , with a limited mandate, could not stand firm and may be forced to make some

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<sup>153</sup> "Missile Test Said No Cause for Alarm," China Post ( July 19, 1995).

concessions on certain issues regarding the status and future of Taiwan.

On the other hand, for the perspective of the PRC ongoing or coming power struggle in the post-Deng era, the maneuvers may reflect an internal struggle for prestige between Jiang Zemin and the military of which he is the titular head. If so, the “Taiwan issue” is merely treated as a means to draw attention.

What is Taiwan’s reaction to the PRC’s aggressive strategy? Would the mainland China-Taiwan Chicken game continue into the future? Or, could it be possible for both sides to reverse the game to Prisoner’s Dilemma or Deadlock? Before answering these questions, we should take a couple of endogenous and exogenous factors into account.

At the moment of writing this thesis, the presidential elections on Taiwan just ended, with Lee Teng-hui’s overwhelming victory ( Lee attained almost 55 % of the popular vote). This result may indicate that Lee’s attitude and position on mainland China would dominate the development of mainland China-Taiwan relations in the future. In other words, Lee’s request for peaceful coexistence and Taiwan’s international standing will be high on the agenda for adjusting the current mainland China policy. To appease the tension across Taiwan Straits after the election, Taiwan authorities intend to resume the channel of mutual communication through SEF and AFRATS. On the other hand, the government is reportedly inclined to accept the proposal for direct contacts (trade, mail, and transportation) initiated by the PRC under one condition--the PRC views Taiwan as an equal political entity.

If both sides allow direct contacts, Taiwan, a country lacking of natural resources and cheap labor, would gradually depend on mainland China more than ever. By contrast, Taiwan's economic and political systems may gradually affect the PRC. In general, through direct contacts, through either the model of people to people or government to government, mutual differences between both sides regarding the reunification of China or other issues would be reduced. Moreover, the PRC could force Taiwan's leaders to drop the idea of independence or stifle the movement of Taiwan independence to a certain extent. Since direct contacts are conducive to increase mutual benefits, then, the question would be: Could it be possible for the PRC to recognize Taiwan as a political entity? If so, the policy makers in both sides have to take into account what extent and in what form they could conduct such a settlement. In fact, the chance of such recognition is slim in the short term. Facing the coming succession crisis in the post-Deng era, the new generation of leaders would not take a weak position on the Taiwan issue because no one can bear the likely reproach like the loss of Taiwan.

Could this developing tendency turn into actions? As for the possibility for the PRC's military attack against Taiwan, based on the internal calculation, the PLA judges that the conditions are not really ripe for them to take Taiwan by force. The reasons include: (a) the Taiwan military is quite strong; (b) Taiwan with a strong financial position, a huge foreign reserve, can procure weapons from the international market quite easily, if necessary; (c) the U.S. may commit to Taiwan's security

according to the Taiwan Relations Act; (d) Taiwan has not yet declared independence and the PRC has not yet been pushed to the corner; (e) they would damage official relations with the U.S. if the PRC launched military actions toward Taiwan; (f) even if the PLA successfully conquered Taiwan, the PRC would encounter a major problem regarding the governing Taiwan, which according to the more sober members of the PRC government was beyond their present capacity.<sup>154</sup>

Reportedly, in October 1995, Taiwan announced that it would increase by 20% of the defense budget for the year 1996-97, bring it to \$11 billion.<sup>155</sup> In addition, Taiwan in recent years has been dedicated to an upgrade of its military equipment. They have secured contracts on F-16s from the U.S. and Mirage 2000 jets and six Lafayette-class frigates from France. According to one Japanese source, given its financial power and the capacity to introduce Western technologies, up till the end of twentieth century Taiwan's defense capacity will exceed that of the PRC.<sup>156</sup> If this evaluation is valid, the cost for the PRC to take Taiwan by force will be higher than evaluated. Besides, the PRC continues to reform its economic system. As Chen Yun pointed out in the early 1990s, it would be unwise for the PRC to intensify pressure on Taiwan by military muscle instead to encourage cooperation

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<sup>154</sup> Weiqun Gu, p. 35.

<sup>155</sup> The Economist (February 3, 1996): 29.

<sup>156</sup> World Journal (July 17, 1991): 10; (November 13, 1991): 7; also see Yu Yuan-ro, "It Is Impossible for the Iraq-Kuwait War Model to Appear in the Taiwan Straits," World Journal (August 10, 1990): 7.

between both sides. In addition, due to the American commitment to Taiwan's security based on the Taiwan Relations Act of 1979, the PRC's attempt to conduct military activities against Taiwan will be depressed, directly or indirectly.

According to the preceding inferences, we may predict that both sides would continue to play a game of Chicken in which Taiwan will gradually become a real counterpart to mainland China. The enhancement of penalties for mutual defection which results from Taiwan's military improvement will obviously contribute to the maintenance of the dynamic balance between both sides. Also, this would discourage mainland China from adopting more aggressive actions toward Taiwan in future games. By contrast, the use of direct contacts between both sides will increase mutual payoffs and inspire the players to cooperate. In addition, signing a peaceful agreement in which mainland China rules out the likelihood of using force toward Taiwan and Taiwan promises to cooperate in promoting the reunification of China is also possible for both sides.

Based on the logic of our model-- Chicken, and since mutual defection would inevitably lead the players to mortal disaster, we may predict that decision-makers in mainland China and Taiwan as rational actors will try their best to eschew it and cooperate an effort to explore a bilateral acceptable settlement for the future of China and Taiwan.

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