

An Analysis of the Bai-He Strategy of Guiguzi Culture in the Perspective of Game Theory

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Abstract—Guiguzi summarised the techniques of lobbying and subjected them to inductive analysis, producing a work that is the culmination of lobbying, known as Guiguzi culture. In this study, the rationality and applicability of the strategy of Bai-He of Guiguzi culture were subjected to dialectics and analysis on the basis of the views of game theory. The findings demonstrated that the arguments proposed in the strategy of Bai-He in Guiguzi culture still conform to the behaviours exhibited in modern society of selecting a game strategy.

Keywords—game theory; Bai-He strategy; Guiguzi culture.

I. INTRODUCTION

John Nash proposed the concept of Nash equilibrium in 1950 and divided games into cooperative and noncooperative games [1, 2] which had a profound influence on the later development of game theory and strategies. Subsequent Nobel prize winners¹ for work on game theory and game-related fields included Thomas Schelling and Robert Aumann in 2005; Leonid Hurwicz, Eric Maskin, and Roger Myerson in 2007; Lloyd Shapley and Alvin Roth in 2012; Jean Tirole in 2014; and Oliver Hart and Bengt Holmström in 2016.

The *Guiguzi* culture originated roughly 2,400 years ago during the Spring and Autumn period and the Warring States period [3], a turbulent era during which the constant fight among vassal states for hegemony led to the beginning of the political, military, economic, and scientific cultural prosperity of the history and culture of the Chinese nation. The era also laid the foundation for the unprecedented emergence of numerous schools of thinkers who introduced various ideas, and it was in this era that Guiguzi, the originator of the School of Diplomacy, was born. In fact, *Guiguzi* is a practical and philosophical classic that is valued by researchers of the historical development of the Chinese nation and is also greatly appreciated in Japan.

Accordingly, studies on game theory and game-related strategies are greatly emphasised in modern social science. *Guiguzi*, which was written before the Common Era, had a crucial role in the application of strategies (both military and social life applications) in Chinese culture and society, thereby bringing stability to a turbulent era. Thus, the purpose of this

¹John F. Nash, Reinhard Selten, and John Harsanyi won the Nobel Memorial Prize in Economic Sciences in 1994.

study is to examine the strategy of *Bai-He* (manoeuvres) in *Guiguzi* culture by using game theory to determine whether the text still contains arguments that can be recognized by and applicable to the modern world.

II. LITERATURE REVIEW

A. Evolution of Game Theory

Game theory was proposed by a Hungarian-American mathematician John von Neumann [4] in 1928. He proved that two players in a limited zero-sum game will have a rational action plan as long as they have opposing interests, and this discovery is known as the minimax theorem. The concept of minimax embodies a pessimistic view of a player regarding their likelihood of obtaining favourable results. That is to say, Player A believes that the optimal strategy selected by Player B will reduce Player A's payoff. Because it is a zero-sum game, the optimal strategy adopted by Player B is the worst strategy for Player A.

Nash divided games into cooperative and noncooperative games, and proposed the Nash equilibrium for noncooperative games. Nash believed that any preferences and number of participants can be regarded as concepts of a general solution and that no participants in a game have an incentive to deviate from the chosen strategy. This combination of strategies is referred to as the Nash equilibrium solution. Additionally, Nash believed that negotiation is a key factor in cooperative games.

Selten (1975) [5] believed that the Nash equilibrium is established under the circumstance that the participants act simultaneously; however, this equilibrium may be problematic after considering the participants' sequence of actions. Selten proposed the concept of dynamic games wherein the participant to make the first mover in a game can take advantage of an advanced position and anticipate that the second movers will make rational responses to produce the most favourable strategies, thus yielding the subgame perfect Nash equilibrium. This equilibrium is a subset of the dynamic game Nash equilibrium and is more refined than the Nash equilibrium.

B. Guiguzi Culture

Guiguzi and his eponymous book have always respectively been regarded as the representative figure and work of the

School of Diplomacy. Guiguzi (390–310 BC), who was approximately 180 years younger than Confucius, was born 150 years after Zigong, and was of the same era as Mencius (372–289 BC). Seeing that Confucius’s lobbying attempts with Confucianism were unsuccessful, Guiguzi, who had an ambition to save the world, summarised the techniques of lobbying and subjected them to inductive analysis in order for them to be applicable to the world, and the resulting work can be said to be the culmination of lobbying.

Guiguzi, whose real name was Wang Xiang, was said to be born in Wey either during the Spring and Autumn period or during the Warring States period. Because he lived in seclusion in Guigu, Qingxi, he was nicknamed as Guigu Xiansheng (Mr. Guiguzi). The work *Guiguzi*, also known as *Bai-He* (manoeuvring strategies), consists of three volumes [6], focuses on skills of strategy formulation, discourse, and debate, and is completely preserved in the Taoist classic *Daozang*. According to its content, *Guiguzi* mainly concerns negotiations and lobbying, which also involve a lot of strategic considerations that are similar to military tactics.

C. Manoeuvres in Guiguzi Culture

Bai-He (Manoeuvre First) serves as a general outline for the ten chapters in *Guiguzi*. According to the book, the principle of *Bai-He* is the fundamental rule for lobbying, and it consists of ten lobbying methods that are small-scale applications of the principle. In the strategy of *Bai-He*, discourse and lobbying skills are divided into “*Bai*” and “*He*,” whereas characters, events, and objects are divided into “*Yin*” and “*Yang*.”

According to *Bai-He strategy*, “*Bai*” (speak out) and “*He*” (remain silent) are the two variations of speech, and one should master the ability to recognise appropriate times for speaking out and remaining silent. Therefore, the use of *Bai-He* should follow two principles: “If one plans to practice ‘*Bai*’, or open up to entice others, sufficient planning and consideration is required. If one intends to be secretive and strike at others covertly, then one should remain hidden and reticent.”

In brief, an individual should alternate between employing “*Bai*” and “*He*” to produce adaptable strategies and attain complete mastery of the skill [7]. “*Bai*” is the driving force that turns night into day and reflects the process of energy emission. Conversely, “*He*” is the driving force that turns day into night and reflects the process of energy convergence. The path of practising “*Bai*” and “*He*” necessarily passes through time and space in four phases (midnight, noon, sunrise, and sunset, which can be understood as representing a process from beginning to end) and through four orientations (north, east, south, and west).

D. Strategy of Game Theory

Game theory is also known as a “strategic” interactive situation in which the participants affect each other through their decisions and actions. Specifically, in this situation, participants are concerned with the final payoff or the value of the benefits they receive. Additionally, an assumption in such situations is that people are rational; their goal is to pursue

maximum payoff, and the payoff or benefits are not merely affected by their own actions but also by the actions of other participants.

In game theory, the strategies of any game must have the following elements: (1) players who participate in the game; (2) strategies that players can adopt; and (3) payoffs, namely rewards that form into combinations corresponding to the combinations of strategies adopted by players. Because players may be confronted with a variety of situations, payoffs in games are often presented in the form of a payoff matrix.

III. RESEARCH METHOD

The “static / dynamic” game theory with complete information (Table I) was used as the research structure and method in this study, which conducted a preliminary exploration on the strategy of *Bai-He* in Guiguzi culture.

To analyse the strategy of *Bai-He* in Guiguzi culture from the perspective of game theory, the main content of the strategy of *Bai-He* was summarised as two philosophical propositions, on the basis of which relevant analyses were conducted using different case studies.

The two philosophical propositions are as follows:

Proposition 1: Yin-Yang strategy during *Bai-He* strategy;

Proposition 2: Revealing (*Bai*) constitutes understanding others;

IV. RESEARCH ANALYSIS AND ARGUMENTS

A. Proposition 1: Yin-Yang strategy during *Bai-He* strategy; firmness and flexibility

(A rough interpretation of the text from Guiguzi is as follows) Observing the actions of various saints throughout history reveals that they have always led the trends of pioneering thought or been the prophets of the people. They can understand the principles and the meaning of life and death by observing changes in all aspects of balance in the natural world such as Yin-Yang strategy; firmness and flexibility. Since ancient times, changes in these aspects have always followed the natural laws of Yin and Yang strategies. Despite their seemingly endless changes, they still follow patterns such as reunion, and separation, flexibility, firmness, openness, closeness.

Game theory: Nash equilibrium analysis

TABLE I. GAME TYPE WITH COMPLETE INFORMATION

Game type	Complete information
Static	Nash equilibrium
Dynamic	Subgame perfect Nash equilibrium

In *Strategy: An Introduction to Game Theory*, Watson (2013) stated while playing games, people pay attention to the interactive effects of the strategies adopted by other players. These effects can be roughly summarised as follows: (1) conflicts between individuals and group interests; (2) strategic uncertainty (diversity); and (3) inefficient coordination. In his doctoral thesis on static games with complete information, Nash proposed that an “equilibrium” solution must exist in a nonzero-sum noncooperative game [8].

In brief, if a pure strategy games with a set of principles that eliminates incentives causing players in both parties to deviate from a strategy combination, then this strategy combination is the optimal strategic response for both parties, and this set of principles achieves the Nash equilibrium.² In other words, the Nash equilibrium can be applied in games to determine the equilibrium solution in which no incentives have been provided to any players that can cause them to deviate from a strategy combination.

Dialectics and Analysis:

(1) *Yin and Yang strategy: firmness and flexibility*: Nash divided games into cooperative and noncooperative games. For noncooperative games, he proposed the concept of Nash equilibrium. By contrast, Nash believed that communication or negotiation is the key factor in cooperative games. Accordingly, games can be divided into Yang (cooperative) and Yin (noncooperative) games, and the application of negotiation strategies is required to turn Yin games into Yang games. In other words, conversion between Yin and Yang games is only possible through strategies that coordinate flexibility and firmness, openness and closeness, and relaxation and tension.

(2) *By observing changes, saints are able to name all existing objects and understand the principle life and death*: If players can identify the strategy adopted by their competitor in a game, then they can thus determine the optimal strategic response. Additionally, by applying the concept of Nash equilibrium, an equilibrium solution from which no player has any incentive to deviate can be determined. This is similar to the process by which saints observe changes in all aspects of balance in the natural world (e.g., *Yin & Yang*, reunion & separation) and understand the meaning of life and death. Since ancient times, all changes have always followed the natural laws of *Yin* and *Yang*. Such a view from *Guiguzi* should be consistent with the concept of Nash’s “game equilibrium”.

B. Proposition 2: Revealing Bai-strategy constitutes understanding others; the coordination of revealing and concealing (Bai-He) can change the Yin and Yang of situations

(A rough interpretation of the text of *Guiguzi* is as follows) If an individual wishes to take an active move and reveal themselves to people, then he or she should be cautious and detail-oriented and avoid careless behaviour. The value of being cautious, being detail-oriented, and maintaining a low

profile lies in subtlety and interactions with nature. The purpose of taking an active move and revealing themselves to people is to determine the other party’s true nature, whereas the aim of concealing is to acquire the other party’s sincere collaboration. In brief, in the principle of *Bai-He*, the objectives of opening up and remaining silent are both to induce changes in the various internal contradictions among events and objects as well as all aspects of the nature from the beginning to end of the four seasons (time).

Game scenario and problem analysis:

Scenario 1: static games with complete information;

According to the Nash equilibrium, in the static game with complete information in Table II, when B selects the “Yin” strategy, and A selects the “He” strategy, the resulting payoff for A is 1; by contrast, the payoff for selecting the “Bai” strategy by A is 0. Therefore, when B selects the “Yin” strategy, the optimal response for A is to select the “He” strategy. Moreover, when A selects the “He” strategy and B selects the “Yin” strategy, the resulting payoff is 6, whereas the payoff is 5 if B selects the “Yang” strategy. Thus, when A selects the “He” strategy, the optimal response for B is to select the “Yin” strategy. Accordingly, (He, Yin) is the Nash equilibrium solution for this game; and the other Nash equilibrium solution (Bai, Yang) can also be obtained using the same approach. In other words, this game contains two pure Nash equilibrium solutions; (He, Yin) and (Bai, Yang).

Scenario 2: Dynamic game with complete inform.

Selten (1975) proposed the concept of dynamic games to complement the shortcomings of the concept of Nash equilibrium. This enables the first mover to determine the optimal strategic response for both players, and such a response is known as the subgame perfect Nash equilibrium.

A dynamic game with complete information involves switching game scenario 1 (Players A and B simultaneously decide their strategies) to another scenario in which Player A makes his or her decision first, after which Player B decides his or her optimal response after considering Player A’s strategy. Fig. 1 shows the game tree for a dynamic game with complete information.

The two games in scenarios 1 and 2 share the following conditions: (1) the players involved are the same (player A and B); (2) the players use the same strategy; (3) the payoff is the same under the same strategy combination. The difference between the two games is as follows: in scenario 1, the strategies adopted by Players A and B are decided at the same time, whereas in scenario 2, Player A decides his or her strategy first, and then Player B determines his or her optimal response.

A total of two Nash equilibrium solutions is derived from scenario 1, namely the strategy combinations of (*He, Yin*) and (*Bai, Yang*). Next, the solutions are examined in terms of their feasibility in scenario 2.

² See Nash’s definition of the Nash equilibrium.

TABLE II. STATIC GAME WITH COMPLETE INFORMATION

		B	
		Yin	Yang
A	Bai	(0, 0)	(2, 1)
	He	(1, 6)	(1, 5)

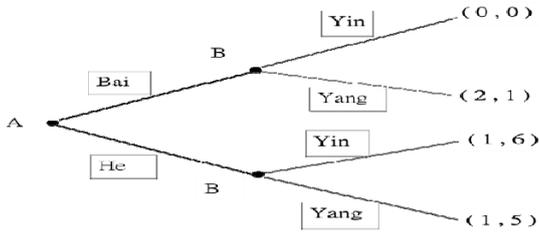


Fig. 1. Dynamic game tree with complete information.

If A first selects the “Bai” strategy, then B will select the “Yang” strategy; in this case, the payoff obtained by A is 2. Because selecting the “Bai” strategy yields a higher payoff for A compared with selecting the “He” strategy (payoff = 1), A can maximise his or her benefits by selecting the “Bai” strategy, in response to which B will select the “Yang” strategy. In this situation, if B declares that he or she will select the “Yang” strategy, then “Bai” is the optimal response for A. Therefore, the strategy combination of the Nash equilibrium solution (Bai, Yang) is a reasonable equilibrium solution in this scenario and is also a subgame perfect equilibrium solution.

Subsequently, the feasibility of the other Nash equilibrium solution (He, Yin) in this scenario was examined. If A believes that B will select the “Yin” strategy, then his or her optimal response is selecting the “He” strategy to obtain a payoff of 1. However, if A is permitted to decide his or her strategy first and has complete information, then A would like to select the “Bai” strategy as the optimal response. Consequently, in B’s subgame, “Yang” is B’s optimal response. Therefore, “He, Yin” is not a reasonable equilibrium solution in this scenario.

Among the two Nash equilibrium solutions obtained in the static game with complete information, only the strategy combination of (Bai, Yang) yielded a solution that was consistent with the dynamic game with complete information.

Dialectics and Analysis;

(1)Revealing (Bai) constitutes understanding others: According to scenario 2, the primary factors that determine the subgame perfect equilibrium solution are whether A is the first mover to make decisions and whether A is provided with complete information; these factors determine whether A selects the optimal response. This corresponds to the statement in Guiguzi that revealing (Bai) constitutes understanding others. Accordingly, B can only determine his or her optimal response after A has decided his or her strategy.

(2)The coordination of revealing and concealing (Bai-He) can change the “Yin” and “Yang” of situations: Of the two Nash equilibrium solutions obtained from the static game with complete information, only the strategy combination of (Bai, Yang) was consistent with the dynamic game with complete information. Therefore, in games with complete information, the equilibrium solution changes if the scenario changes from a static game to a dynamic one. This is consistent with the statement in Guiguzi that the “coordination of revealing and concealing (Bai-He) can change the Yin and Yang of situations.

V. CONCLUSION

In this study, the findings are summarised as follows:

(1)Games can be divided into Yang (cooperative) and Yin (noncooperative) games, and the application of negotiation (Yin-Yang strategies during Bai-He strategy; flexibility & firmness, openness & closeness, and relaxation & tension) is required in order to turn a Yin game into a Yang one. The statement regarding “coordination between Yin and Yang strategies, as well as relaxation and firmness” in Guiguzi is consistent with the Nash’s game concept.

(2)Under the condition in which complete information is provided, the optimal response by the second mover depends on the strategy adopted by the first mover; this is consistent with the statement that revealing (Bai) constitutes understanding others. This is in line with the idea that “the coordination of revealing and concealing (Bai-He) can change the Yin and Yang of situations” proposed in the strategy of Bai-He, which, when applied in games, enables an individual to change by enacting change based on understanding as well as determining how and when to change, thereby attaining the optimal response.

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