

Games and Human Behavior :

Von Neumann, Morgenstern, and Beyond

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Abstract The purpose of this paper is to shed a new light on games and human behavior, with a special emphasis on "human behavior" in a very wide sense, thus dealing with "economic behavior" as its only one aspect. In my long academic career, I had often lively conversations with Marina von Neumann Whitman, the only daughter of the mathematical genius John von Neumann. She was Professor of International Finance at the University of Pittsburgh in which I was working as Assistant Professor of Mathematical Economics. At a seminar at Pittsburgh, Oskar Morgenstern encouraged me to pay special attention to the Economics of Risk and Uncertainty. According to Mitsuo Suzuki, the Theory of Games, which was a joint product of von Neumann and Morgenstern, has often misunderstood and even criticized. Such misunderstanding has been partly due to the vulgar name of "Games". In my opinion, the application of the Theory of Games should not be limited to Economic-Rational Behavior, but rather widely extended to Human Behavior influenced by Emotion, Air-Ethics and History. This paper intends to shed new light on the famous duel of Sherlock Holms and Professor Moriarty. Moreover, the long and friendly transactions between Ohmi Merchant and Regular Customer are carefully analyzed within the framework of Non-Zero-Sum Games. so that "The Principle of Three-Way Advantage" will be shown to be valid even today. I look forward to seeing the arrival of the second Richard Thaler for still further development of Behavioral Economics in the near future.

I. Von Neumann and Morgenstern in My Memory

The theory of games was established by the joint product of mathematical genius von Neumann (1903 - 1957) and economic genius Oskar Morgenstern (1902 - 1977). Since they had different backgrounds in terms of birthplaces and educational backgrounds, it was a sort of miracle of miracles for them to jointly produce such an "academic phantom" with a strange name of "Theory of Games". The result of their long struggle was finally crystallized as a rather unbalanced book in the sense that it had a very brief preface less than one page but a very bulky contents more than 600 pages.

As was mentioned above, the book title "Theory of Games and Economic Behavior" gave its readers a great variety of impressions and repercussions, depending on their academic backgrounds and current occupations. The main purpose of this paper is, therefore, to critically reexamine the whole picture of the book from new angles in order to indicate both its strengths and weaknesses, thus hopefully shedding new lights on its still further developments in the future.

First of all, I would like to pay attention to the following deplorable opinion by Professor Suzuki (1928 -), a leading pioneer of the Theory of Games in Japan, who honestly described the sad state of the Theory of Games when it was first introduced worldwide.

Fifteen long years have inactively passed since *The Theory of Games and Economic Behavior* was jointly written by von Neumann and Morgenstern. ... In spite of such long years, however, that to my regret, this new theory has not been well received yet. Honestly speaking, I am not ready yet to say that it has been widely comprehended in Japan. Not only that, I would rather observe the inconvenient fact that it has been often misunderstood and even criticized.

(Suzuki, 1959, Preface, page 1)

It is noted here that such a honest yet depressing remark was made by the authoritative sensei Suzuki on 8th February 1959, i.e. the second anniversary of John von Neumann's death. Then, I myself was just a sophomore hoping for a bright future at Kobe University. No doubt, that remark gave me so great shock that I had to be obliged to move all Games Theory books into the corner of my bookshelf. I was then a young and ambitious student at Kobe University, which was unfortunately surrounded by street demonstrations of many people crying for anti-government slogans. In short,

there were very few places in which young spirited teenagers could take even short breaks. For myself, the only way of escape from such chaos was to merely continue my study of advanced mathematics at the Science Department although I myself was originally economics major.

I still vividly remember the sad fact that the "double tragedy" occurred to me in early spring in 1965. More exactly, on 26th March 1965, double shock waves bitterly hit me when I lodged at a private house near the foot of Mt. Rokko. One of the shock waves was concerned with the untimely death of Ansei Goto, a very talented friend of mine, who was fond of sincerely discussing with me about the serious question how we should live in the then disordered world. Another shock wave was related to the death of Kenji Hayashi from long illness, who was famous of an eloquent speaker among us, ambitiously aiming to establish his own theory of monetary economics. On the one hand, Goto was born at Hitachi of North Ibaraki in which I myself much later worked for University of Tsukuba for twenty long years. On the other hand, while Hayashi's birthplace was Yamaguchi, I myself was once Assistant Professor at Hiroshima University, the neighboring place of Yamaguchi. Most importantly, both Goto and Hayashi, being very good friends each other, happened to pass away on the same day, namely on 26th March 1965. I now sincerely hope that they have met together and continued lively discussions everyday in the other world. Hopefully, I myself could join them some time in the near future. ¹⁾

Now, let me get back to my own relationship to John von Neumann, Oskar Morgenstern, and the Theory of Games. Personally speaking, I have never met John von Neumann who died at Princeton in 1952, namely the year when I myself was a primary school student and had a hard time to live with my parents in the war-damaged city Osaka. Later in the memorable city Pittsburgh, however, I was very lucky enough to become acquainted with Marina von Neumann Whitman, only daughter of mathematical genius John von Neumann. ²⁾

When I was appointed as Assistant Professor of Mathematical Economics there, she was already well-established as Professor of International Professor. When I first met her in front of the elevator door at Social Science Building, she frankly self-introduced to a new comer like me.

Hi, I guess you're Yasu Sakai, a new comer to Pitts. I'm Marina Whitman. You can just call me Marina. All the faculty members will welcome you. If there are anything you don't know, please ask me or any other member right away.

(Marina Whitman's Conversation with Yasuhiro Sakai, Pittsburgh, September 1972)

Her frank and kind words gave me a very nice impression about Pittsburgh, which was once nicknamed as "the Iron City" or even "the Polluted City". A few weeks later, I dared to ask her a frank question as follows:

Marina, I have one question to ask you. You may know that I've been asked by the Chairman that I have to teach Math Econ, presumably a very hard subject, to Pitts students. Could you give me a good advice to me about it?

(Yasuhiro Sakai's question to Marina Whitman, Pittsburgh, Fall 1972)

To my surprise, her answer to my inquiry was rather straightforward but a bit out of my expectation.

You might know that my father [John von Neumann] was a well-known expert in advanced mathematics. Every teacher assumed that I was also born as an expert in math. So, at all schools, whenever I asked serious math questions to teachers, they just smiled a bit and then ignored me. Perhaps, because of such ignorance, I had to change my major from economic theory to more practical subjects like international finance.

(Marina Whitman's Reply to Yasuhiro Sakai, Fall 1972)

As some readers might have noticed well, this was a typical "Father and Daughter Story", in which the straight identification of the pair of parent and child could produce a strained relationship between the two generations. Scientifically speaking, Father is Father, and Daughter is Daughter. They should never be allowed to mix them up. In reality, however, many human beings are apt to fall into a trap of misidentification.

As far as I stayed at Pittsburgh, I was very lucky to enjoy my academic life. In addition to Marina Whitman, all the faculty members were very friendly, giving me kind advices whenever they were needed. In particular, I would like to mention the following names. They were Asatoshi Maeshiro (majored in econometrics), Mark Pearlman (economic thought), Dick Wells (regional economics), G. S. Chou (economic policy), Jack Ocks (public economics), Arnold Katz (applied economics), Jim Kenkel (statistics), Joseph Korliras (macro economics), Gene Gruver (micro economics), Arnold Knoner (international economics), and many others.

Still now, I cannot forget the first meeting with Professor Oskar Morgensren, joint creator of Game Theory with von Neumann), who happened to have seminar at the University of Pittsburgh. As soon as his impressive seminar talk on "The Present and

Future of Economic Science" was over, I was brave enough to ask him the following question:

Sir, I have been quire impressed by your talk today. To be honest, however, I myself am not quite satisfied with the present state of Economic Science. Opening almost all textbooks, very good things such as general equilibrium, global stability, and public welfare are assumed as the natural order of things. I do think, however, that there are a lot of irregularities, instability, shut-downs and lay-offs. So, I am afraid that those bad things will continue in the coming years. Then, sir, do you give me some advice on the new arrival of the Wave of New Economic Science against the old and traditional way of economic science?

(Yasuhiro Sakai to Oskar Morgenstern, Pittsburgh, Spring 1974)

Carefully listening to my rather straight question, Morgenstern sensei seemed to be a bit surprised. After a pause for minutes, he smiled and replied to me in the following way.

Oh, a nice question to me, Mr. young man. I'm also seriously concerned with the Future of Economic Science. Fortunately, I can tell you that New Waves of Economic Science are now coming. One of them is the Economics of Risk and Uncertainty. You look young enough to learn such a New Wave. So, why don't you start it right away?

(Morgenstern to Sakai, Pittsburgh, Spring 1974)

For "a young man at Pitts", this sounded like "Heaven's Blessing". Before I was appointed as Assistant Professor at Pitts, I gave everything I had got, thus concentrating on studies in Microeconomics and General Equilibrium Theory. Morgenstern sensei's kind advice, however, changed my future research plan completely. Then, I felt a fresh blast of wind so strongly blowing on my face that I was induced to resume research on the New Economics of Risk and Uncertainty. ³⁾

At the same time, I took a new look at the Theory of Games, which was originally developed by John von Neumann and Oskar Morgenstern. To be more honest, Morgenstern's advice aforementioned revived my strong interest in the Theory of Games, which I had already been learned from my teachers at Rochester, that is Richard Zabel and James Friedman. ⁴⁾

At this point, let me insert here my personal memory in Japan. In 1959 or the "Year of Storm and Stress", the hard-fighter Suzuki sensei succeeded in publishing the very first book on the Theory of Games in the Land of the Rising Sun whereas I myself

became an ambitious sophomore at Kobe University. When I opened the first page of the book, the following inconsolable grief jumped into my eyes.

Fifteen long years have inactively passed since *The Theory of Games and Economic Behavior* was jointly written by von Neumann and Morgenstern. ... In spite of such long years, however, to my deep disappointment, this new theory has not been well received so far. Honestly speaking, even at present, I have to say that its comprehension has been rather limited in Japan. Not only that, I would regrettably observe the more sorrowful fact that it has been often misunderstood and even criticized. (Suzuki, 1959, Preface, page 1)

Note that such a honest yet depressing remark was made by Suzuki sensei himself on 8th February 1959, i.e. the second anniversary of John von Neumann's death. Although more than sixty long years have passed since then, my first sad impression on the Theory of Games has never been completely passed away. I have tried several times to change it so far. As the first love would never fade away, so my first impression of the Theory of Games has not completely vanished even now.

Now, I have to temporarily stop writing here my own relation to von Neumann and Morgenstern. In the next section, Section II, I focus on Morgenstern's special favoritism to the duel between famous detective Sherlock Holms and infamous detective Professor Moriarty. It is noted that the Holmes-Moriarty duel represents a dramatic yet mere fiction in the literature, thus nothing to do with real Human Behavior with many diverse motives. Section III will focus on the historical role of the Ohmi Merchant played in the Exchange Economy in Pre-Modern Japan. In particular, the Principle of Three-Way Advantage will be closely analyzed in the framework of Non-Zero-Sum Games. And final remarks will be made in Section IV.

II. Morgenstern's Special Favoritism to the Holmes-Moriarty Duel

In 1999 or the final year of the twentieth century, Japanese leading scholar Mitsuo Suzuki published his very final book on the Theory of Games, entitled *The World of the Theory of Games*. It was systematically written in Japanese, thus being widely regarded as his "swan song". To most of "Fans of the Theory of Games" like myself, Suzuki sensei's song did not seem to sound cheerfully, but rather melancholy. Therefore, it is of much importance for us to understand why his final song had to sound so melancholy.

Suzuki sensei's first book on the Theory of Games was published in 1959, the year

when I was just a sophomore at Kobe University. Therefore, to our surprise, forty long years passed between the first book and the last book. During those years, so many things happened to Japan and the world. During those years, my private and public addresses had to change so many times. First of all, I lived at three different addresses in Kobe, then going abroad to the United States where I traveled in Hawaii, Seattle, Mt. Lanier, San Francisco, Los Angeles, Arizona, Grand Canyon, Denver, Colorado, St. Louis, Chicago, Rochester, Niagara Falls, and later Buffalo, New York City, Washington, D.C., New Orleans, and many other places in the United States. I even traveled abroad as far as Paris, Ex-an-Provence, Rome, Venice, Florence, London, Dublin, Berlin, Mexico City, Soul, Taipei, Peking, Dahlien, and so on.

Concerning Professor Suzuki's life and work, it could be well-characterized as the remarkable career of strong determination and remarkable consistency. Indeed, his honest recollection shown below clearly indicated for his long and painful struggle for the recognition of the Theory of Games in the academic world of Japan and the whole world.

For a long time, I have been often asked the following question by so many people. "What is the Theory of Games all about?" Unfortunately, there was a certain group of people who regarded it as the supreme theory for learning game-winning techniques. Alternatively, there was another group who thought it as the best technical theory for making television games. Moreover, there was a third group who disliked much the name of "the Theory of Games", thus requiring for a complete name change.

(Suzuki, 1999, page 3)

I can easily guess Suzuki sensei's long and lonely struggle for great escape from wrong interpretations and undue rumors. I do think, however, that such possibly improper naming should not be Suzuki sensei's fault, but rather due to the original co-authors, namely von Neumann and Morgenstern.

Unfortunately, careful examination of the book title *Theory of Games and Economic Behavior* seemed to produce another sort of misunderstanding. In my opinion, the shortsighted expression of "Economic Behavior" should be replaced by the wider-ranging expression of "Human Behavior". Even after Suzuki sensei got older and became a famous professor in the Japanese academic circle, he nevertheless sadly deplored the continuing state of underestimation of the Theory of Games as follows.

The theory of games was born when von Neumann published a remarkable paper on that theory in 1928, and later firmly established in 1944 by the big volume *The Theory of Games and Economic*

Behavior coauthored by von Neumann and Morgenstern. Very long years had to idly pass, however, until its rightful evaluation as a major breakthrough was finally recognized worldwide. To be worse, it barely existed on the extreme margin of survival, being a subject of bitter criticism for such a long time. (Suzuki, 1999, page 11)

The proper question here was why such a grand Theory of Games has been unduly evaluated and even neglected for a very long time. I guess that there should have been several reasons for such under-evaluation.

First of all, a sort of negative war effect should not be ignored. In fact, during the Second World War, there existed very few readers who could afford to buy and read a big volume containing more than 600 pages such as *The Theory of Games and Economic Behavior*. Second, the communication language used between von Neumann and Morgenstern was not proper British English, but rather heavily German-accented and long-winded English. ⁵⁾

Third, the title name itself seemed to be strange and even foreign to an ordinary man in the street. I am now more sure than ever before that the word "Economic Behavior" should be changed to "Human Behavior". This was because neither Holmes nor Moriarty, the two characters loved by the authors, behaved as a simple-minded persons for just money-seeking. On the contrary, Holmes was a "Man of Fighting for Justice", and Moriarty an "Evildoer Executing Injustice". In particular, I would like to strongly point out Oskar Morgenstern's special favoritism to the duel between Sherlock Holmes and Professor Moriarty. I am afraid that many readers of such a bulky book with a strange title would merely regard the book as a grand-designed expansion version of detective story, with Holmes as the famous detective and Moriarty as the infamous criminal

Oskar Morgenstern was very fond of reading Conan Doyle's detective stories, thus taking pride for becoming a member of "Sherlockian Group" or the world-wide group of Sherlock Holmes fans. John von Neumann was basically a cool-headed mathematician, yet having sympathy for Morgenstern's favoritism to Sherlock-type detective stories. Miraculously, the joint work of von Neumann and Morgenstern succeeded in producing an "Academic Wonder-Book" named the Theory of Games. For greater details, see Morgenstern (1928, 1935, 1972,1976), Poundstone (1992), Shubik (1967, 1987), Sakai (2019a, 2021, 2022b, 2024), and many others.

Interestingly enough, Oskar Morgenstern already two times introduced Conan Doyle's exciting detective story "The Final Problem" dealing with "The Sherlock-Moriarty Duel" even before it finally appeared in the finished grand work

Theory of Games and Economic Behavior , Princeton University Press, 1944, coauthored by John von Neumann. For the sake of the record, let me write down below those two earlier works by Morgenstern alone.

- ① Morgenstern, O. (1928) *Wirtschaftsprognose: Einer Untersuchung ihrer Voraussetzungen und Möglichkeiten* (English: *Economic Forecasting: a Study of its Difficulties and Impossibilities*), Springer Verlag, Vienna.
- ② Morgenstern, O. (1935) *Vollkommene Voraussicht und Wirtschaftliche Gleichgewicht* (English: *Perfect Foresight and Economic Equilibrium*), *Zeitschrift für Nationalökonomie*, Vol. 6, No. 3.

Let me take a look again at the long time sequence: 1928-1935-1944. It vividly demonstrated a lengthy and painful path of the Theory of Games recorded from the start to the finish . We should also keep in mind that in the historical year of 1928, von Neumann bravely published his first mathematical paper on the Theory of Games. In retrospect, such a miracle of miracles appeared in the academic world at the very difficult time of the Great Depression and the Second World War.

As the saying goes, saying is believing. Following this wise maxim, let me write down here the following passage, which first appeared in Morgenstern (1928), later reproduced in Morgenstern (1945), and still later quoted again in Schotter (1976).

Sherlock Holmes, pursued by his opponent, Moriarty, leaves London for Dover. The train stops at a station on the way, and he alights there rather than traveling on to Dover. He has seen Moriarty at the railway station, recognizes that he is very clever and expects that Moriarty will take a faster special train in order to catch him in Dover. Holmes anticipation turns out to be correct. But what if Moriarty had been still more clever, had estimated Holes' mental abilities better and foreseen his action accordingly? Then, obviously, he would have traveled to the intermediate station. Holmes, again, would have had to calculate that, and he himself would have decided to go on to Dover. Whereupon, Moriarty would again "reacted" differently. Because of so much thinking they might not have been able to act at all, or the intellectual weaker of the two would have surrendered to the other in the Victoria Station, since the whole flight would have become unnecessary. (Morgenstern 1928, Morgenstern 1935, quoted in Schotter 1976, pp. 175-176)

Here, we would perhaps be surprised to see the infinite sequence of outthinking, outthinking again, and so on between Sherlock Holmes and Professor Moriarty. To a very rational mind, this would appear as a useless long sequence of utopian guessing

games. The real world, however, would not follow this absurd way, thus trying to find a much more clever solution by means of cutting an infinite sequence of outguessing games. In order to escape from such an infinite outthinking sequence, Morgenstern badly needed a powerful help from the first-rate mathematician von Neumann. As a result, the math-econ duo, namely von Neumann and Morgenstern, finally appeared at an ideal place like the Higher Institute of Princeton University.

As far as I could see, there existed at least three critical duels between Sherlock Holmes and Professor Moriarty. Those three times duplication demonstrated the author Conan Doyle's special (and even unbalanced degree of) favoritism to the Holmes-Moriarty duel. So, let me carefully analyze the Holmes-Moriarty dual as the core of Doyle (1892). The main characters were just two persons — the "Master Detective" Sherlock Holmes and the "Napoleon of Crime" Professor Moriarty.

Suppose the situation in which Sherlock Holmes has been persistently pursued by his opponent Professor Moriarty, thus attempting to leave the capital London by train toward the port city Dover. As is seen in Fig. 1, the train can stop at the intermediate station Canterbury on the way, and Holmes gets off there rather than directly traveling on to Dover terminal, from which he is able to get on the ferry over the British Channel to reach the Continent for great escape..

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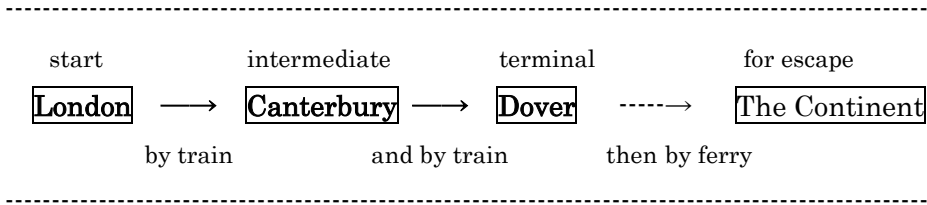


Fig. 1 The train starts at London, stops at Canterbury on the way, and finally arrives at Dover Terminal, from which any person can get on the ferry over the British Channel to reach The Continent.

At first glance, both players — Sherlock Holmes and Professor Moriarty — are in a sort of game-theoretical situations. It is supposed here that the two players are equally clever persons. Presumably, one person's benefit means another person's loss. In other words, borrowing the terminology of the Theory of Games, the players engage in a special type of Zero-Sum Game.

The critical question at issue is what the good strategies for Holmes should be, and also what the good strategies for Moriarty should be. The escaping detective Holmes, who is persistently pursued by the chasing attacker Moriarty, thus leaving the big capital London toward the port city Dover for great escape. Then, as is clearly seen in Fig. 2, Holmes must make a choice between the following two strategies.

[Strategy Dover]

Directly going to Dover Terminal.

[Strategy Canterbury]

Quitting at Canterbury Intermediate Station

Moriarty, who is persistently following Holmes, is also assumed to make a choice between Strategy Dover and Strategy Canterbury. Therefore, as is shown in Fig. 2, both Holmes and Moriarty can possess the following four possible combinations.

[Identical Combination of Dover and Dover]

Holmes and Moriarty meet at Dover. Holmes will be attacked by Moriarty. Holmes's payoff is assumed to be negative, say (-10) , and Moriarty's payoff is assumed to be positive, say $(+10)$.

[Identical Combination of Canterbury and Canterbury]

Holmes and Moriarty meet at Canterbury. Holmes will be attacked by Moriarty. Holmes's payoff is (-10) , and Moriarty's payoff is $(+10)$.

[Cross Combination of Dover and Canterbury]

Holmes will reach Dover, and later the Continent. Moriarty remains to be still dangerous. .
Holmes's payoff is $(+2)$, and Moriarty's payoff is (-2) .

[Cross Combination of Canterbury and Dover]

Holmes will quit at Canterbury. Moriarty will reach Dover.

Both should be neither happy nor unhappy, so that their payoffs are assumed to be (0) or just zero.

It should be noted that because a "Zero-Sum Game" is assumed here, the sum of Holmes's payoff and Moriarty's payoff is just zero: Indeed, $(-10) + (+10) = 0$, $(-2) + (+2) = 0$, and $(0) + (0) = 0$.

		Professor Moriarty	
		Dover	Canterbury
Sherlock Holmes	Dover	Homes is attacked (-10, +10)	Holmes out of England (+2, -2)
	Canterbury	Holms in England Moriarty out of it (0, 0)	Holmes is attacked (-10, +10)

Fig. 2 Holmes versus Moriarty: The Final Problem as a Zero-Sum Game

Generally speaking, there exist presumably many types of Zero-Sum Games in the real world. On the one hand, there exist "very light games" exemplified by ordinary card games played by children. Those games can be repeated so many times just for the sake of pleasure. On the other hand, there may exist "more serious games" in the sense that they cannot easily be repeated again. No doubt, the Sherlock-Moriarty duel under question represents the most serious game since it exemplifies one of "once and for all games" among all dangerous games imaginable. In short, the duel can be rightly regarded as a life-and-death struggle.

Given the matrix seen in Fig. 2, how do we find a reasonable solution? This is a Zero-Sum Game, meaning that one player's gain produces the other player's loss. For an instance, if Sherlock wins 2 units, then Moriarty loses 2 units. And if Moriarty wins 10 units, then Sherlock loses 10 units. Interestingly enough, there are two distinct solutions available — "the practical solution" shown by the noblest Doyle (1892), and "the hypothetical solution" proposed by the academic duo of von Neumann and Morgenstern (1944) and later endorsed by the Japanese academician Suzuki (1959). Here, we see another kind of interesting confrontation between "the practical solution" and "the hypothetical solution".

Let me carefully compare the two distinct solutions. First, the practical solution was clearly shown by the following passage by the noblest Doyle himself.

"There he [Moriarty] goes", said Holmes, as we watched the carriage swing and rock over the point.
"There are limits, you see, to our friend's intelligence. It would have been a coup-de-maitre
[master stroke] he deduced what I would deduced and acted accordingly." (Doyle 1894, p. 340)

Under the present situation, I myself was sure that Moriarty was clever enough to catch up to Holmes even after London terminal and patiently wait for another chance to attack Holmes somewhere in the Continent. I myself would not quite agree with Holmes's opinion that Moriarty uselessly went through Canterbury. As the saying goes, "it is a long lane that has no tuning." Alternatively, "everything comes to him who waits."

Remarkably, Morgenstern raised a strong objection against Doyle's "practical solution" aforementioned, thus arguing that Doyle completely disregarded the existence of "the mixed strategies" and simply followed actual developments. Later, Mitsuo Suzuki (1959) became a strong support of von Neumann and Morgenstern (1944), thus voicing his own opinion more clearly.

The conclusion would state that Moriarty's best strategy should be going on to Dover with probability $3/5$, and Holmes's best strategy, with probability $2/5$. In other words, what Moriarty should do at this stage is to make the lottery which totally contains five tickets, with only three tickets for "going on to Dover" and the remaining two tickets for "quitting at Canterbury", and then to finally decide which option to choose on the basis of the result of the lottery."

(Suzuki, 1959, p.55)

Let us imagine "the first situation" in which the Napoleon of Crime Professor Moriarty was willing to make the excessively detailed type of lottery which contained those five tickets, with only three tickets for "going on to the Dover" and the remaining two tickets for "quitting at Canterbury". Moreover, let us also imagine "the second situation" in which Moriarty was a spontaneously acting man with "animal spirits" à la the master economist J. M. Keynes. Perhaps, no ordinary man in the street would believe that those two situations were somehow compatible in the real world. The same reasoning would also be applicable to the decisive detective Holmes, namely Moriarty's life-long enemy. ⁶⁾

In conclusion, von Neumann-Morgenstern's pet idea of mixed strategies in Zero-Sum Games could not be applied at all in the splendid Holmes-Moriarty duel created by the first-rate novelist Conan Doyle. I myself would like to point out that Morgenstern's special favoritism to Doyle's detective stories may be a double-edged sword: There are both benefits and disadvantages to the grand body of the Theory of Games.

III. The Ohmi Merchant on Three-Way Advantage: Zero-Sum or Non-Zero-Sum Games ?

In the above, I have intensively discussed Oskar Morgenstern's special favoritism to the dual between the famous detective Sherlock Holmes and the infamous criminal Professor Moriarty. Although the Holmes-Moriarty duel might be a very remarkable drama in the British literature, it was clearly no more than a mere fiction, thus having nothing to do with historical reality. Now, I have to turn my attention to historically more important trade activities of the Ohmi merchant in Pre-Modern Japan. In this connection, one of the most critical questions should be whether and to what extent the Ohmi merchant was involved in Zero-Sum or Non-Zero-Sum Games.

Just before analyzing the commercial activities of the Ohmi merchant, I would like

to refer to the Nobel Prize winner John Hicks's academic transformation from Economic Theory to Economic History. More exactly, Hicks published a rather short yet very outstanding work on bridging between Economic Theory and Economic History: it was briefly named *A Theory of Economic History*. Note that perhaps because of his characteristic modesty, he did not employ the more authoritative expression like "The Theory of Economic History". The difference between the indefinite article "a" and the definite article "the" was very critical here. ⁷⁾

To tell the truth, the following remark by the grand master Hicks gave a profound impact on my own research direction in recent years:

What shall we start? There is a transformation which is antecedent to Marx's Rise of Capitalism, and which, in terms of recent economics, look like being more fundamental. This is the Rise of the Market, the Rise of the Exchange Economy. It takes us back to much earlier stage of history, at least for its beginnings, so far back indeed that those beginnings (or first beginnings) we have direct information. (Hicks, 1969, p. 7)

In his more recent book, Hicks (1977) stressed that the key figure in the competitive market was the merchant who bought goods in order to sell.

My own approach to the issue has also been historical, but I began by thinking about Marshall rather than Walras. How did Marshall suppose that a competitive market worked? His answer was less explicit, but (so far as I could recollect it) it seemed less peculiar. The key figure was the merchant, wholesaler or shop keeper, who buys in order to sell again.

(Hicks, 1977, Preface and Survey, p. ix)

Those remarks by John Hicks on the Rise of the Merchant (in the Exchange Economy) gave me a great shock like a bolt from the blue sky. First of all, around in the 1970s, Hicks already distinguished himself as a first-rate authority on economic theory, thus having been awarded a Nobel Economic Prize for his outstanding contribution on pure theory and welfare economics. Therefore, his extra effort for extending his research to cover Economic History came to me as a shock. And secondly, whereas he pointed it out that the Principle of All-Round Advantage could be somehow applied to the Exchange Economy, he had to make reservations for its universal applicability in the light of British unhappy trade history. More exactly, he himself acknowledged "even irregularities and dark places" of the mighty British Empire. In the light of British Economic History, I myself have to say that the Slave Trade in the

Atlantic Triangle represented truly cruel and inhuman aspects of the Empire rather than mere irregularities and dark places. We should never turn our head away from unpleasant history.

It is high time for us to pay special attention to the Rise of the Ohmi Merchant which, contrary to the British Merchant engaged in the opium and slave trade, brought progress and prosperity to all the parties concerned. The core of the Ohmi Merchant's activities was characterized as the Principle of "Sampo Yoshi" or "Three-Way Advantage". According to the famous professor Eiichiro Ogura, Shiga University, such a behavior principle could be rooted far back to the Nakai antique documents recorded around four hundred years ago. Today, the essence of the principle aforementioned was nicely summarized by the following passage.

No matter how far you may go on a peddling tour in a foreign land, you should show great respect to your customers when you are selling kimono clothes to them. Then, you should take an attitude of "customer first", never expecting to acquire huge profit at a single stroke. You should be the very modest person who thinks that everything is determined by the grace of Heaven. Besides, you should also take much care of the local persons in the way of peddling. After all, you should always have religious faith in God and Buddha.

Iwane (ed.), 2003, pp. 37-38)

The Ohmi Merchant must show great respect to the Regular Customers, so that the commercial deal must be not only "Urite Yoshi" or "Good for the Seller", but also 'Kaite Yoshi" or "Good for the Buyer". Besides, it must be universally effective in the sense that it is "Seken Yoshi" or "Good for "the Whole Society". In short, any commercial transactions must be "Sampo Yoshi" or "Good for Three Ways". ⁸⁾

On 30th May 2009, Shiga University and the Asahi Newspaper Company jointly hosted the Special Symposium on "The Ohmi Merchant and Today: New Lessons from Old Sayings" at the Biwako Hall, Hikone. The key note speaker was Uichiro Niwa, the president of Itochu Trade Company, who delivered a fervent speech with the title " The Principle of Three-Way Advantage as an Effective Guide for Resolving the Current Crisis". When I myself was attending as one of associate speakers there, I was strongly realized that "The Spirit of the Ohmi Merchant" was still alive today, thus having been very effective for solving many socioeconomic difficulties. Surely, we can learn many lessons from old sayings. ⁹⁾

The idiomatic phrase "Sampo-Yoshi" or "Three-Way Advantage" has been very well-known everywhere in Japan, thus being long and widely used by many people. It was also paraphrased by the longer expression "Good for the Seller, Good for the Buyer,

and Good for the Whole Society". No one knew exactly who was the first person to employ it. I believe that Eiichiro Ogura was one of the pioneers of studies in the Ohmi Merchant, thus very frequently using such a famous phrase in his books and papers. So, It seemed that Ogura sensei was at least one of critical promoters for widely spreading the phrase.

In the framework of game-theoretic framework, it is clear in Fig. 3 that there are two players — Ohmi Merchant and Regular Customer. Ohmi Merchant may have a lot of strategies depending on weather and economic conditions. For the sake of simplicity, let me assume the following two conditions — Good Conditions and Bad Conditions. ¹⁰⁾

[Strategy Good Conditions]

Ohmi Merchant takes a moderately positive strategy, keeping in mind that good conditions will not persist forever.

[Strategy Bad Conditions]

Ohmi Merchant does not think those bad conditions so seriously, keeping in mind that the conditions will be recover soon.

Regular Customer, who has long maintained regular transactions with Ohmi Merchant, is also assumed to make a similar choice between Strategy Good Conditions and Strategy Bad Conditions. Consequently, as is seen in Fig. 3, both Ohmi Merchant and Regular Customer can possess the following four possible combinations,

[Identical Combination of Good Conditions and Good Conditions]

Although both Ohmi Merchant and Regular Customer are in Good Conditions, they do not estimate the conditions so optimistically, but rather foresee their possible changes from Good to Bad. So, their estimated payoffs are moderate, thus being indicated by (+7, +7). The Principle of Three-Way Advantage is nicely realized here.

[Identical Combination of Bad Conditions and Bad Conditions]

Because both of them firmly believe in the Principle of Three-Way Advantage, they will never foresee that Bad Conditions will not continue, but recover soon. Consequently, both continue to have minimum transactions. Their payoffs will be maintained at the positive bottom line, namely as small as (+1, +1).

[Cross Combination of Good Conditions and Bad Conditions]

Ohmi Merchant is in Good Conditions, whereas Regular Customer is in Bad Conditions. Even under such non-symmetric circumstances, Merchant and Customer are cooperative with the belief that their minimum trust will continue forever. Hence, Merchant's payoff is (+5), whereas Customer's payoff is (+3).

[Cross Combination of Bad Conditions and Good Conditions]

Ohmi Merchant is in Bad Conditions while Regular Customer is in Good Conditions. Although Surrounding Conditions are non-symmetric between the two players, they are cooperative and friendly as expected. Merchant's payoff is (+3), and Customer's payoff is (+5).

		Regular Customer	
		Good Conditions	Bad Conditions
Ohmi Merchant	Good Conditions	three-way advantage (+7, +7)	mutual trust remains (+5, +3)
	Bad Conditions	mutual trust remains (+3, +5)	minimum transactions (+1, +1)

Fig. 3 Ohmi Merchant on Non-Zero Sum Game: The Principle of Three-Way Advantage

All of those Identical and Cross Conditions are nicely allocated in Fig. 3 here. In contrast to the Final Problem involving the aforementioned duel between Sherlock Holmes and Professor Moriarty (see Fig. 2 above), the relationship between Ohmi Merchant and Regular Customer is always friendly and cooperative. The two players have been long connected on the basis of mutual trust, so that each player always keeps from excessive request for his partner. Modest continuation of friendly partnership should be the keyword for both sellers and buyers. All of them firmly believe that only in this way, it will also be beneficial for the society as a whole. Thus, the Principle of Three-Way Advantage will transmit from the present generation to the next generation.

In conclusion, the framework of Non-Zero-Sum Games should be applicable not only to the activities of merchants. I strongly believe that it will also be very effective to solve a wide range of socioeconomic problems. In contrast to "The Three-Way Advantage Society" aforementioned, however, Thurow (1988) claims that we live in a more hostile society characterized as "The Zero-Sum Society". The critical question would be which type of society we wish to live in. Besides, we are now likely to be in the New Age of Uncertainty, in which the modern phantoms of J.M. Keynes (1936) and Knight (1921) seem to set out to new and active lives. So many further investigations in many directions will be urgently required.

IV. Soseki Natsume on Human Behavior: Intellect, Emotion, and Determination

The great writer Soseki Natsume (1867 - 1916) distinguished himself as a very careful observer of human behavior, once having written the following passage.

Following a mountain path, I have long thought of the important question what human behavior is all about. There are three key factors for our behavior. They are intellect, emotion, and determination. First, if we exclusively rely on intellect, then our nerves become quite edgy, producing thorny human relations. Second, if we are largely influenced by emotion, then we are likely to lose our independence, resulting in the loss of identification. And third, if we show our strong backbone, then we feel cramped in a confined space, resulting in decreased convenience.

(Natsume, 1906)

When I began to read the great book by von Neumann and Morgenstern (1944), I was just a sophomore at Kobe University. It was not only a very bulky book of more than 600 pages, it also had a very strange photograph on the cover. As soon as a

steady gaze at it taught me that the photograph looked like a playing-card fortune-teller, I could hardly hide my surprise. Then, I asked a young and friendly professor the following straight question. "This book looks like a guidebook for gambling. Sir, is it really a very famous book on the Theory of Games which has recently drawn many attentions in social sciences?" The professor showed me an expression of mixed feelings., and gave me a short reply. "Oh, My. Sakai, I myself have also been puzzled as to what to deal with the Theory of Games. I am afraid that it will take at least ten or twenty more years for us to understand the real value of such a seemingly eccentric book."

Since then, more than sixty years passed, but my first impression of the Theory of Games have never completely vanished until today. By contrast, the psychological gap between the great writer Soseki Natsume and myself have gradually smaller and smaller every year. I am in basic agreement with Natsume that Intellect, Emotion and Determination constitute the three key factors for the determination of Human Behavior. It seems to me that Economic Behavior emphasized by von Neumann and Morgenstern represents only one element of Human Behavior, which should be a much bigger entity to be scrutinized. There is certainly a gap between Human Behavior and Economic Behavior. Besides, the gap seems to be bigger and bigger, and complicated with the time that has elapsed.

In recent years, a new type of economic science, being called Behavioral Economics, has become very popular. Fortunately, one of the promoters of this new field, is Richard H. Thaler, who was once a good friend mine when I was a graduate student of economics at the University of Rochester for the period 1968-1972.

At Rochester, Thaler used to study the mixture of Old and New Economics. While Old Economics was exemplified by microeconomics, general equilibrium theory, international economics and so on, New Economics was represented by economics of risk and uncertainty, new theory of games, econometric history and so on. It seemed that Thaler did not find much interest in those "Old Type of Economics" which assumed the ultra-rational behavior of "Econs", thus shifting his attention to the "New Type of Economics" built on more emotional and more will-powered behavior of "Humans". The ultimate result of his ultra-human efforts was successfully crystallized as what he nicely called "Behavioral Economics". ¹¹⁾

I strongly believe that economic science is now in the process of great transformation. Behavioral economics might shed a new light in such a new direction. As far as my present observation is concerned, however, it is not good enough to accomplish a new revolution in economic science. I look forward to seeing the arrival of

the second Richard Thaler in the not-far future.

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Footnotes

1) The untimely death of Mr. Ansei Goto on 26th May 1965 still remains deep in my memory. Although more than sixty years have passed, the following passage he left in his death note will eternally influence until my own death. "I [Goto] am free. Nothing will destroy my eternal love for perfect freedom. Now, my friends, farewell !" Mr. Kenji Hayashi, another good friend of mine, also passed away on the same day. For greater details, see Iyemoto, Misaki et al. (1965).

2) Gamow (1947), a famous science fiction writer and Nobel Physics Winner, once asked the young girl Marina the interesting question how smart you were compared to her father, namely von Neumann. Then, Maria replied that except mathematics, she was smarter than her father except mathematics, and continued to claim that even in the abstract field of mathematics, she was as good as her respected daddy..

3) In hindsight, the meeting with Morgenstern gave me an important turning point of my research change from economic theory to economic reality. For details, see Sakai (2019b, 2022).

4) I was very grateful to the two gentlemen Edward Zabel and James Friedman for kindly taking care of the evening graduate seminar "Theory of Uncertainty and Games". We would never forget to spend our happy beer-drinking time together after the seminar was over.

5) In addition to such a language problem, I also found the special picture of a skillful card-game player on the book cover. Perhaps, because of such a "sensational cover", around ten copies of the first edition sold to even professional gamblers. Speaking of myself, I was a bit proud of organizing the Special Session "Theory of Uncertainty and Games" at Tsukuba in 1988.

6) For recent discussions on animal spirits, see Akerlof and Shiller (2009).

7) John Hicks was one of the greatest economists in the twentieth century. As he got older, he changed his research area from economic Theory to economic History. When the Nobel Economics Prize was given to him in 1972 for his contribution to Theory only, he had mixed feelings for receiving the prize. It seemed that for the older and more matured man Hicks himself, History was as important as Theory. For greater details, see Sakai (2026).

8) Although there were some controversies on the origin of "the principle of the tree-way advantage", every researcher seemed to agree that it had a certain root on the legendary Nakai document on the Ohmi merchant. For this point, see Inoue (1890), Egashira (1965), Ogura (1946, 1980, 1990), Suenaga (2000, 2011), Usami (2021), and others. Interestingly enough, the following witty remark seems to be in a similar situation. "Tensai wa wsureta koroni yattekuru". In English, "Natural disasters must come before our eyes when those are almost forgotten in our mind." This famous phrase was generally thought of a shortening of the following long sentence by the famous natural scientist Torahiko Terada. "We must always keep in mind that according to the iron rule of nature, a set of bad lucks are destined to come sometime in the future. Therefore, we must do sufficient preparations for those unlucky years when we are in rather lucky years without serious

disasters. Although such cycles of bad and good years are apparently present before our eyes, it is our inescapable destiny that we are all so forgetful of those plain facts of life. " (Terada, 1934) Terada (1878-1935) wrote this famous essay just one year before his death. Perhaps, he might have foreseen the tragic and inescapable history of Japan during the Pacific War (1941-1945).

9) In contrast to the Ohmi merchant, the Liverpool merchant engaged in the famous (or infamous) Atlantic Triangular Trade with the slave trade occupying a key position. Therefore, the latter merchant must be discussed within the framework of Non-Zero Games. For details, see Sakai (2018).

10) The Theory of Games, especially Non-Zero-Sum Games, was greatly developed by the Nobel Economic Prize Winner John Nash and others, thus being extensively applied to many socioeconomic problems. We have to keep it in mind, however, that any good theories are imperfect, thus having weaknesses built-in. For those points, see the vast literature including Aumann, Hart (eds.) (1992); Dasgupta, Gale, Hart, Maskin (eds.) (1992); Dixit, Nalebuff (1991); Luce, Raiffa (1957, revised 1989); Nakayama Muto, Funaki (eds.) (2000); Nasar (1998); Poundstone (1992); Sakai (2001, 2021, 2022a, 2022b, 2022c, 2024); Shubik (1962); Taleb (2007); Varoufakis (2001); Yoshioka (1996). As the saying goes, a journey of a thousand miles starts with a single step.

11) For details on the work of Richard Thaler, one of my close friends at Rochester, see Sakai (2025). "Oh, I'm a lazy man." This seemed to be his favorite phrase when he was a young graduate student. It was really one of great wonders that such a lazy man became a Nobel laureate when he got a bit older.