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USING GAMES BARGAINING IN THE LABOR ISSUES

The aim of this study is to examine the literature on game theory, behavioral game theory, and bargaining method, and to find out the role of game bargaining in the employer-employee relationship by using a case study. To achieve the objectives, the author researched scientific articles published in reputable scientific journals and analyzed the case study by using a systematic trial-and-error method along with game theory and the bargaining method. This study makes a significant contribution to our understanding of negotiations and decision-making processes in labor markets. The methodology applied combines the principles of game theory, which analyzes strategic interactions between employer and employee, with the systematic trial-and-error method, which involves iteratively testing different negotiation strategies to identify the most effective ones. By using this method, employer-employee relationships can benefit from improved communication, collaboration, and more mutually satisfactory agreements.

Keywords: Game theory, bargaining, labor issues.

1. INTRODUCTION

Game theory is a mathematical framework used to study how rational decision-makers, known as players, interact in strategic contexts. The choices made by each player have an impact on the result, and their choices depend on their beliefs about the other players' decisions. The primary goal of game theory is to identify the rational choices (strategies) for each player and the possible outcomes (payoffs) resulting from their decisions. Additionally, it is an effective framework for studying interactions among rational decision-makers in a variety of fields, such as economics, politics, biology, psychology, and computer science. Game theory is a crucial area of study in decision-making, conflict resolution, and strategic planning because it is constantly changing and influencing various disciplines.

There are the following key concepts in Game theory: 1. Players, Strategies, and Payoffs: In a game, players make decisions based on strategies, which lead to different payoffs (Von Neumann & Morgenstern, 1953); 2. Normal Form and Extensive Form Games: Games can be represented in normal form (strategic form) or extensive form (game tree) (Harsanyi, 1967); 3. Nash Equilibrium and its Properties: Nash equilibrium represents a stable outcome where no player has an incentive to deviate unilaterally (Nash, 1950a);

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4. Dominant and Mixed Strategies: Dominant strategies dominate all other strategies for a player, while mixed strategies involve randomizing between choices (Gibbons, 1992).

Game theory has two types: analytical game theory and behavioral game theory. The theory of analytical games has been used to model phenomena such as disputes between "principals" and the "people" whom they employ to work with, such as employers and employees (Milgrom, Roberts, 1992). Camerer (2003) defined behavioral game theory as "a branch of behavioral economics, an approach to economics that uses psychological regularity to suggest ways to weaken rationality assumptions and extend theory". He (2004) explained the difference between analytical and behavioral game theories: "An analytical game theorist crossing a one-way street only looks one way before crossing the street (the only direction that rational drivers would come from); a behavioral game theorist looks both ways, anticipating possible mistakes".

At all stages of our lives, we engage in the bargaining process. There are two things in common with any bargaining situation (Dixit, Skeath, 2004):

> "1) The overall payoff that the negotiating parties are able to produce and benefit as a result of achieving an agreement should be greater than the amount of the individual payoffs that they may obtain separately-the whole must be greater than the sum of the parts, and 2) This is not a game of zero-sum. Each bargainer tries to get more for himself and leave less for the others. This may appear to be zero-sum, but behind it lies the danger that, if the agreement is not reached, no one will get any surplus at all. This mutually harmful alternative, as well as both parties' desire to avoid it".

In order to determine the role of game bargaining in the employer-employee relationship, this study will examine the literature on game theory, behavioral game theory, and bargaining methods. In this study, a systematic trial-and-error method along with game theory and the bargaining method were used in order to accomplish the goals.

2. LITERATURE REVIEW

2.1. Game theory

Rand & Nowak (2013) defined game theory as "a mathematical formalization of strategic behavior and social interaction represented by a set of players, the choices available to each player, and the payoff earned by each player depending on both her choice and the choices of the other players". The rapid increase in interest in game theory in the academic study started from 1957 (Luce, Raiffa, 1985), and the popularity of the discipline is further demonstrated by the fact that eight Noble Prizes for relevant game theory work have been awarded in the last couple of decades (Sharma, Bhattacharya, 2013).

Many types of research were conducted about game theory, and various definitions, methods, approaches, and types of game theory were presented. According to Gintis (2014), game theory is "multiplayer decision theory where the choices of each player affect the payoffs to other players, and the players take this into account in their choice behavior". Kelly (2011) defined game theory as an independent and interdependent decision-making theory. According to her, game theory is about decision-making in organizations where the result depends on the decisions of two or more independent actors. One of these actors may be nature itself, and none of the decision-makers has complete control over the outcome. Game theory helps understand difficulties in cooperation and information transfer in

organizations. It should be taken into account that sometimes there is a communication gap between the shareholders who own the company and the manager who manages it. As a result, in order to increase his own profit, the manager may conceal the information or transfer manipulated information. Therefore, the right information must be available to those making decisions (Ben abdelaziz et al., 2015).

According to Gächter (2004), there are "three conceptual building blocks of modern game theory: the players' preferences, their strategic reasoning, and the process of learning". Each player's behavior reveals a preference, which means the willingness of the player is to pay to accomplish fairness or to punish unjust behavior. Strategic reasoning explains how players start playing a game. It should be taken into consideration that people can make some mistakes while playing games and they vary in their levels of iterated reasoning. Learning models clarify how people adjust their strategies as a function of their gameplay experience and give us an idea of how equilibration may happen empirically.

The models of game theory that were/are presented by different scholars can be used to examine a wide range of phenomena, such as the theory of Nash equilibrium which is used to study political competition, the theory of repeated games are used to illuminate social phenomena like threats and promises, and so on (Osborne, Rubinstein, 1994). Game theory typically refers to a series of procedures used to predict optimal actions when the result depends on multiple "players" choices (Pandey, Chermack, 2008). To express its ideas formally, the game theory uses mathematics. A mathematical formulation allows the precise interpretation of terms, verifies the accuracy of ideas, and finds out the consequences of assumptions (Osborne, Rubinstein, 1994). Therefore, the game theory approach can be used especially in statistics, engineering, biology, computer science, and other technical fields (Gacar, 2021).

Before talking about Game Theory in detail, it would be better to look through its history. The history of the game theory goes back approximately to the XVII century (Kelly, 2011), and several main contributions were made to it before John von Neumann and Oskar Morgenstern. However, John von Neumann and Oskar Morgenstern (1953) introduced the main features of the game theory. They defined the game as the sum of the rules that describe it, and the process which is played in a specific way from beginning to end is its play. They also wrote that game consists of moves, rules, and strategies. Moves are the component elements of the game, and they are the possible choices between different alternatives made by one of the players under the rules of the game. The rule of the game is absolute command, and its violation is forbidden. Strategies in the game can be selected by the players, and it ups players to use, change, or reject them (Morgenstern, Von Neumann, 1953).

The German mathematician Ernst Zermelo played an important role in the research of Game Theory. He published an article on Chess appearing in 1913 and proved the first formal theorem in the theory of games. He mentioned that every rival two-person game has the best strategy for both actors, provided both actors possess complete information about each other's aims and choices (Schwalbe, Walker 2001). Scientists started to follow Zermelo's theorem.

The fundamental theorem of game theory became the minimax theorem. The Minimax theorem argues that in a competitive game, each player possesses a strategy, and none of the actors deplore their preference for strategy when the game is over (Kelly, 2011). Borel tried to prove the minimax theorem in 1924, but he failed (Kelly, 2011). The minimax theorem was proved by the Hungarian mathematician John von Neumann. Later, John von Neumann and Morgenstern decided to combine their efforts and publish a book, although

their writing style was in sharp contrast, and in 1944 the book, namely "Theory of Games and Economic Behavior", was published. (Kelly, 2011).

It should be mentioned that John von Neumann is called a founding father of the game theory and John Nash as a prodigal son (Kelly, 2011). John Nash (1951) generalized the minimax theorem by showing that in both mixed and pure strategies every rival game has at least one equilibrium point (a leading concept of game theory) and he gave his name to the equilibrium points representing these solutions. It is defined in the two-player context as "the pair of strategies from which neither player deviates because a unilateral change of strategy does not produce a payoff improvement" (Witteloostuijn, 2003). A Nash equilibrium is a situation where no party can gain by making a one-sided deviation from the prescribed behavior (Milgrom, Roberts, 1992).

John Nash (1950a) suggested that rational actors change their strategies before they reached an "equilibrium" in which any one-sided modification was not advantageous (a fixed point in the mapping from approaches to the best reaction approach). Nash, John Harsanyi, and Reinhard Selten were together awarded the Nobel Prize for their scientific study on games played over a period, and games in which each of the players has private information about their motivations (Camerer, 2004).

Kuhn & Tucker (1953) took out from Zermelo's theorem the two-person zero-sum constraint by replacing the notion of the best individual strategy with the Nash equilibrium. He showed that in pure strategies every n-person game of perfect information possesses an equilibrium and introduced the concept of sub-games. Their contribution developed Selten's concept of sub-game perfection (Kelly, 2011).

Game theory became more famous after the book namely "Games and Decisions: Introduction and Critical Survey" published in 1957 by Duncan Luce and Howard Raiffa. They mention that players in game theory were believed to be completely aware of the game's rules and pay-off functions, but that this was impractical in reality (Luce, Raiffa, 1985). Harsanyi (1967) introduced the theory for the analysis of games of incomplete information where players are unsure about certain essential parameters of the game situation, but each of them has a subjective distribution of the probabilities over the alternatives. This contribution caused the foundation of various applications for economics.

Osborne & Rubinstein (1994) define Game theory as a collection of analytical tools created to help understand the phenomena which noticed during the interaction of decision-makers. The basic premises underlying the theory are that decision-makers follow well-defined exogenous objectives (they are rational) and take into consideration their knowledge or expectations of the other decision-makers' behavior (they reason strategically) (Osborne, Rubinstein, 1994).

In game theory players, outcomes, pure strategies are the main ingredients (Kelly, 2011). Players or decision-makers can be person, organization, or nature. A game must have two, or more players, one of which may be nature. The game may consist of many players, but they must be known and infinite. An outcome is the result of the strategic selections set by all the players in the game and players have clear preferences among the possibilities. A pure player strategy is a campaign plan for the entire game and stipulates in advance what the player must do in response to any eventuality (Kelly, 2011).

There are three types of games: skill games, chance games, and strategy games (Kelly, 2011). A game with one player is called a skill game, in which the outline property is the presence of an individual player who completely heads up all the results. The chance game is also a one-player game against nature. Here, players cannot totally control the results, and certain results cannot inexorably be brought about by strategic selections. The game

results depend partly on the preferences of the player and partly on nature, who is a second player. Games that consist of two or more players, not including nature, are called Strategy games, and each of the players partially heads up the results. Strategy games can be divided into games with two players and games with multiple players (Kelly, 2011).

The information that players possess during the game is divided into four types: complete, incomplete, perfect, and imperfect information (Kelly, 2011). With complete information, players know their own strategies and pay-off functions and those of other players. With incomplete information, players know the rules of the game and their own preferences, but not the pay-off functions of the other players. In perfect information, players choose sequentially strategies and know what other players have already chosen. In imperfect information, players only guess what the other player will do in ignorance of each other's movements. (Kelly, 2011)

Heap & Varoufakis (2004) pointed out four fundamental assumptions of the rationality of human behaviors that are the basis of game theory: instrumental rationality (actors know their strictly primary strategies and decide rationally); common knowledge of rationality (in a zero-order common knowledge of rationality, players are instrumentally rational, but they know nothing about the rationality of each other). But in the first-order common knowledge of rationality, players are instrumentally rational, and they believe that other players are also rational; common priors (players believe that rational agents will share the same view of what they are); and action within the rules of the game (players understand the rules of the game and know all the potential actions and how to combine them to produce different payoffs for each player).

Overall, it can be concluded that the goal of game theory is to find optimal solutions to conflict and cooperation situations, assuming that players are instrumentally rational and behave in their own best interests. Sometimes, solutions can be discovered, but sometimes formal attempts at a solution can fail. Generally, game theory provides a fascinating viewpoint on the essence of strategic selection in well-known and unusual circumstances (Kelly, 2011).

2.2. Behavioral game theory

Camerer (2003) defined behavioral game theory as “a branch of behavioral economics, an approach to economics that uses psychological regularity to suggest ways to weaken rationality assumptions and extend theory”. He (2004) pointed out that a behavioral game theorist considers all possibilities to anticipate potential mistakes. Behavioral game theory unites experimental evidence and theory in order to better understand strategic behavior in economic, political, and social interactions (Bonau, 2017; Camerer, 2003).

In previous experiments of game, the theory was assumed that players are concerned only about their own payoffs and introspect, or they adjust their way to an equilibrium in which all players react best to each other (Camerer, 2004). It is proven that such kind of human behavior model in strategic interaction is often violated. The violations point to a standard approach, “behavioral game theory”, which statements standard theory to suit noticed regularity with psychological insight (Camerer, 2004). It also offers a context to research the strategic decisions of individual decision-makers to build strategies that are more generally appropriate (Madani, 2010). It is to obtain empirical evidence on how people act in strategic situations (Gächter, 2004).

Scientists apply game theory to various fields such as industrial organization, incentive contracting, labor-management bargaining, etc. In recent years many experiments have been conducted (Camerer 2003) and the behavioral game theory’s three ingredients – social

utility functions; initial conditions (first-period play); and learning theories explain these experimental findings. The social utility functions are built from proving how much players will devote to minimize payoff disparity or reciprocal action that has helped or harmed them. Initial conditions (first-period play) consider that players use various amounts of iterated reasoning or variants of stochastic "quantal response" equilibria in which players foresee unexpected moves by others. A learning theory explains how experience can change behavior.

Game theory has been started using often in economics in the past 50 years. It is used to analyze the behavior of the organizations which are interested in the actions of their competitors. It is also good for managers to understand the behavior of their workers in organizations (Camerer, 2003). The behavioral game theory makes the game theory a more efficient tool for evaluating strategic situations (Gächter, 2004). The behavioral game theory talks about what players actually do. It adds emotions, limited foresight, mistakes, and doubts about how intelligent others are to the analytical theory (Camerer, 2003). The main research technique/tool of the behavioral game theory is the application of psychological knowledge and the conduct of guided laboratory experiments (Gächter, 2004).

2.3. Games bargaining

Game theory can be used to determine how people react in conflict while keeping their own interests in mind. In a typical game, decision-makers (players) seek to outsmart each other by predicting each other's decisions based on their own goals (Madani, 2010). Game theory is also the study of the rational behavior of the players involved in strategic situations characterized by conflict of interests and reciprocal dependency (Dixit, Skeath 2004).

Moreover, game theory is the conceptual and mathematical guideline designed to research competition between parties or players with competing interests. This makes it a perfect candidate for trust-related problems to be analyzed. The principles of cooperation and trust are closely related (Witteloostuijn, 2003). Cooperation is simply defined as an individual pays a cost for another to receive a benefit. Here, cost and benefit are evaluated in terms of reproductive success, where reproduction can be cultural or genetic (Rand, Nowak, 2013).

In a game, players can cooperate by signing a series of bilateral agreements between themselves. Such bilateral cooperative agreements can be represented by links between the agreed parties, and any structure of cooperation can be represented by a collection of links to the agreements. In this way, we can define the set of all possible systems of cooperation with GR, the set of graphs on the players' set (Myerson, 1977). According to Rêgo and Halpern (2012), game theory is a crucial tool for the design and analysis of many phenomena involving interactions between multiple agents. For mutual benefits, employers and employees may choose to cooperate collectively (Dobbins et al., 2017).

Cooperate "game theory" examines effortless bargaining among intelligent actors who can make bilateral contracts about how to play (Crawford, 1997). It varies in three ways:

> "1) it summarizes the structure by the payoffs players can obtain acting alone or in coalitions, suppressing other aspects; 2) instead of explicitly modeling players' decisions, it assumes that they reach an efficient agreement; and 3) it uses simple symmetry or coalition rationality assumptions to characterize how players share the resulting surplus".

In cooperative games, one player's earnings need not be a loss for the other (Pandey, Chermack 2008).

In the employer-employee relationship, there are two cooperative options: a "Golden Rule" effort option and a maximizing private satisfaction option (Leibenstein, 1982). In a "Golden Rule" effort option, employees are more committed to the organization and put much effort into the development of the organization. Employers also provide employees with high salaries, conditions, security, etc. In maximizing private satisfaction options, both employers and employees operate in their own interest. To negotiate effectively, parties use the bargaining method in behavioral game theory.

Bargaining is the process by which economic actors decide on the terms and conditions of an agreement (Camerer, 2003). Camerer (2003) divided experimental studies of bargaining into two groups: unstructured and structured bargaining. In unstructured bargaining, the actors decide the proceeds of bargaining, such as sending message types, the order in which they make offers, etc. Unstructured bargaining shows us what happens when actors are free to create their own rules, and is arguably a stronger model of naturally occurring bargaining. In structured bargaining, the experimenter determines the specifics of the bargaining process. Structured experiments have the advantage of allowing an observer to predict what bargaining outcomes the non-cooperative equilibrium behavior theories could produce.

There are two main bargaining solutions: The Nash solution and The Kalai--Smorodinski solution. Nash (1950) proposed a set of propositions that should be followed by any rational bargaining solution and showed that increasing the product of actors' utilities was the solution that satisfied his propositions (Nash, 1950b). Kalai, Smorodinsky (1975) also presented propositions that are different from Nash's propositions. They thought that if actors' preferences and the utility values changed, then the point of compromise between the actors would not differ. They suggested a solution in which the aspiration levels of the actors should be taken into account.

We are actively participating in the bargaining process at every stage of our lives. Any bargaining situation has two things in common (Dixit, Skeath, 2004):

> "1) The overall payoff that the negotiating parties are able to produce and benefit as a result of achieving an agreement should be greater than the amount of the individual payoffs that they may obtain separately-the whole must be greater than the sum of the parts, and 2) This is not a game of zero-sum. Each bargainer tries to get more for himself and leave less for the others. This may appear to be zero-sum, but behind it lies the danger that, if the agreement is not reached, no one will get any surplus at all. This mutually harmful alternative, as well as both parties' desire to avoid it".

The meaning of games bargaining is the derivation of the "optimum solution" to a negotiation problem by a mathematical method (Allen, 1956). The Game Bargaining method was founded by Nash. Nash (1950b) identifies a two-person bargaining situation, an example of which is the agreement between employer and employees' representative, as one in which two parties can cooperate in more than one way for mutual benefit. However, it should be mentioned that Friedman (1983) in his study, argued that game theory and related theories of bargaining make assumptions that sometimes aren't suitable for the circumstances of the labor dispute. Therefore, it is not advisable to apply game theory in all types of labor conflicts.

3. RESEARCH METHOD

As discussed above, Game theory, behavioral game theory, and bargaining method attracted many scholars, and many researches were conducted over decades on various aspects of them. This study aims to examine the literature on game theory, behavioral game theory, and bargaining method and to find out the role of game bargaining in the employer-employee relationship by using a case study. To achieve the objectives, the author researched scientific articles published in reputable scientific journals and analyzed the case study by using a systematic trial-and-error method along with game theory and bargaining method.

The "systematic trial-and-error method" consists of the following steps (Allen, 1956):

> "STEP 1: Assume that party A gives up all the items he possesses that part, B values higher than A does, and that party B gives up all the items he possesses that party A values higher than B does. Compute the product of A's gains and B's gains from such a trade.
> STEP 2: If in STEP 1 one party receives a greater gain than the other party, the party with the greater gain gives to the party with the lesser gain those items now in the greater beneficiary's possession that both parties value equally. The greater beneficiary should give up the equally valued item or combination of such items that most nearly closes the gap between the parties' gains, or the parties should exchange the combination of equally valued items that most narrows the gap.
> STEP 3: If after the equally valued items have been given over in STEP 2 there is still a discrepancy between the parties' gains, the greater beneficiary will give up items now in his possession that he values more than the lesser beneficiary does. In general, the first items to be tried will be those on which the difference in the parties' valuation is least, working up the scale towards those on which the difference is greatest. After each item changes hands, the product of gains is again computed and compared with previous products. When the product ceases to rise, the optimum solution has been determined".

4. CASE STUDY

"Textile Production" Firm is a newly established company with 20 employees. It was established in 2015 in the capital of Azerbaijan, Baku. The current working hours at the firm are 9:00 to 5:00 from Monday to Friday. Due to the pandemic situation and COVID-19 in the country, people started to buy a lot of masks. Taking into account the demand for the mask, the owner and manager of the firm decided to increase the profit of the firm. They decided to produce masks and sell them to the audience. They made the decision to produce masks and trade them. Therefore, they created a team of five people and intend to extend the working day from 8 a.m. to 6 p.m. (the current working day runs from 9 a.m. to 5 p.m.). They also want to announce Saturday as a working day. Despite these changes, they do not want to increase the number of employees for the team or their salaries. They just suggest free transportation for the employees. However, they also know that in these hard times, it is not easy to find new employees without time-consuming and extra expenditures.

Employees are not satisfied with such kind of decision. They want to be paid overtime for every hour they work. They also want to consider Saturday working hours as additional hours, and these hours should be paid as overtime as well. However, they also understand

the current situation in the country, and they know that it is hard even impossible to find any job if they are dismissed. Therefore, they decided to negotiate with the owner and manager of the company.

There are two parties involved in the dispute; each of them is willing to make a deal for the benefit of both parties and is looking to maximize his gains and minimize his losses. Each of them has two requests.

Employer requests:

ER-1 – to make Saturday a working day

ER-2 – to increase working hours

Employees (will be indicated as W) requests:

WR-1 to pay salary for Saturday as an overtime

WR-2 to pay overtime for every additional hour during weekdays

Taking into account the challenges during the negotiation, they decide to use the service of Bargain Solver. The duties of the Bargain Solver are to compile lists of each side's requests, ask both sides to evaluate each request, and then calculate the optimum solution. They also agreed that once valuations are made, they cannot be changed, and they accepted the result of the Games Bargaining Procedure. During the Game Bargaining, neither party would know what valuations the other party had put on each request until the game was ended.

Before the negotiation, the employer and employees were asked to evaluate their outcomes. Each party needs to determine the relative worth of each request in relation to another request and express that relationship numerically (these valuations (points) represent a thousand AZNs each) in order to compare them. Employer evaluated his outcomes from ER-1 as 35 points and from ER-2 as 7 points: Employees evaluated their outcomes from WR-1 as 18 points and from WR-2 as 6 points. At the same time, they decided to evaluate the other side's requests. The outcome from WR-1 is evaluated as 19 points and the outcome from WR-2 is evaluated as 6 points by the employer. The outcome from ER-1 is evaluated as 23 points and the outcome from ER-2 is evaluated as 2 points by the employees (see Table 1 and 2).

Table 1. Employer's evaluation

Requests	Evaluations
ER-1	35
ER-2	7
WR-1	19
WR-2	6

Source: Author's own creation.

Table 2. Employees' evaluation

Requests	Evaluations
ER-1	23
ER-2	2
WR-1	18
WR-2	6

Source: Author's own creation.

If we calculate the gains and losses for employees, we see that the employees will gain 24 points (18+6) and will lose 25 points (23+2). It can be seen that the employees will give

up 1 point while agreeing with the employer's request. When calculating the gains and losses for the employer, we see that the employees will gain 42 points (35+7) and will lose 25 points (19+6). At the result, the employer will gain 17 points.

From the gains and losses, we can see that, the employer is eager to agree with the request of employees, however, employees are not satisfied enough, because, with this agreement, they are not gain too much and even taking account the situation in the country, they prefer to stay at home. But also they do not want to lose their jobs.

The first requirement of Bargain Solver is the submission of offers along with the requests to expand the scope of the bargaining. In the negotiation between employer and employees, they make the following list:

Employer List

Employer requests

ER-1 – to make Saturday a working day

ER-2 – to increase working hours

Employer offers

EO-1- to provide transportation

EO-2- to provide a meal voucher

Employees List

Employees' requests

WR-1 to pay salary for Saturday as an overtime

WR-2 to pay overtime for every additional hour during weekdays

Employees' offer

WO-1- to decrease the free time from 1 hour to 30 minutes

The Bargain Solver collects all information and compiles them into one file. He gives this file to both parties and asks them to evaluate each of the requests and offers. The evaluations made by parties are shown in Tables 3 and 4.

Table 3. Employer's item evaluation

Requests	Evaluations
ER-1	35
ER-2	7
WR-1	19
WR-2	6
EO-1	6
EO-2	4
WO-1	5

Source: Author's own creation.

Table 4. Employees' item evaluation

Requests	Evaluations
ER-1	23
ER-2	2
WR-1	18
WR-2	6
WO-1	7
EO-1	7
EO-2	5

Source: Author's own creation.

After evaluating all items, the third step of the bargaining situation is ready to implement. The Bargain Solver uses a trial-and-error method to give the optimum solution to the situation. Table 5 shows the calculation of the means of the systematic trial-and-error method.

Table 5. The systematic trial-and-error method calculation

	Solutions		**Employees**			**Employer**			**Pro-duct**
	Employees give	Employer gives	Loss	Gain	Net	Loss	Gain	Net	
Step 1 Each party gives up items he possesses that the other party values more	ER-1 ER-2	EO-1 EO-2	25	14	-11	10	42	32	-352
Step 2 Party with greater gain gives up his equally valued items	ER-1 ER-2	WR-2 EO-1	25	13	-12	12	42	30	-360
Step 3 Party with greater gain gives up one at a time his items which he values more than the other party does Compare products	ER-1 ER-2	WR-1 WR-2 EO-1 EO-2	25	38	13	35	42	7	91

Source: Author's own creation.

When comparing the product points, it can be seen that a maximum point was reached in the STEP 3 transaction, where Employees give up ER-1 and ER-2 in exchange for WR-1, WR-2, EO-1, EO-2. In this transaction, employees gain 13 points and Employer 7 points, for a product of 91. This can be the optimum solution to this bargaining situation.

It should be also mentioned that there is a possibility that with this bargaining solution one of the parties could be not satisfied and agree. In this case, the scope of the bargaining should be enlarged and the calculation steps should be continued.

In the original bargaining situation, where WR-1, WR-2, ER-1, and ER-2 were the only items involved, it was seen that the proposal to exchange WR-1 and WR-2 for ER-1 and ER-2 resulted in a deadlock. If the optimum solution were derived from this original bargaining situation, it would be found to be ER-1 in exchange for WR-1 and WR-2. In this transaction Employees in terms of their own numerical valuations lose 23 and gains 24 for a net gain of 1, while the Employer loses 25 and gains 35 for a net gain of 10. The product of the gains, 1 x 10, is 10. Employees' gain of 1 is so small that it is not inconceivable that Employees would refuse to enter into the bargain at all, especially when the Employer would be getting a gain so large in comparison. In any event, the product of 1 x 10, or 10, is still a far cry from 13 x 7, or 91, obtained from the broadened bargain.

5. CONCLUSIONS

Scientists apply game theory to many fields such as industrial organization, incentive contracting, labor-management bargaining, etc. Conducted literature review and analyzed case study supported that game bargaining plays a key role in the solution of the employer-employee conflict. However, it does not mean that game theory has to apply to all kinds of conflict between employer and employee because game theory and related theories of bargaining make assumptions that sometimes aren't suitable for circumstances of labor dispute (Friedman, 1983).

The application of game theory and the systematic trial-and-error method in employer-employee bargaining in this study has several practical implications. First, using game theory, employers and employees can negotiate more effectively if they are aware of each other's preferences and potential outcomes. Second, game theory allows both sides to plan and find ways to balance their bargaining power, resulting in more equitable agreements. Third, the application of the trial-and-error method allows parties to continuously develop their negotiating strategies and adjust to shifting circumstances. Fourth, game theory helps both sides share relevant information, which leads to better decisions. Fifth, by employing game theory, employer and employee can benefit from improved communication, collaboration, and maximum joint gains

Refer to the existing literature on the application of games bargaining in the employer-employee relationship is under little attention. It is suggested for future researchers to conduct on this topic especially related to Human Resource Management.

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