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THE APPLICATION OF GAME THEORY IN MERGERS & ACQUISITIONS - THE KRAFT HEINZ CASE

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Abstract

Game theory is a mathematical model which can be applied to various situations in everyday life, as well as in the economy. Many are unaware of its importance and impact when negotiating, especially in mergers and acquisitions. Identifying a game correctly is vital to be able to apply the appropriate strategies and for the player or players to obtain the greatest possible benefit.

Although the market currently seems calmer due to the rise in interest rates and increased regulations, mergers and acquisitions continue to be among the favorite options that companies currently use to grow. With the help of game theory, these operations can be improved so that participants have a competitive advantage.

The case of the merger between Kraft and Heinz in 2015 is used as a reference to understand the importance of correctly identifying the "game" that is being played, as well as the correct application of game theory during the negotiation process. The failure in the valuation of the Kraft company demonstrates the effect that an incorrect use of game theory has and the long-term impact it has for these operations.

Resumen Ejecutivo

La teoría de juegos es un modelo matemático el cual se puede aplicar a varias situaciones de la vida cotidiana, así como en la economía. Muchos desconocen de su importancia e impacto a la hora de negociar, especialmente en las operaciones de fusiones y adquisiciones. Identificar un juego correctamente es vital para poder aplicar las estrategias oportunas y que el o los jugadores obtengan el mayor beneficio posible.

Aunque actualmente el mercado se vea más tranquilo debido a la subida de intereses e incrementos de regulaciones, las fusiones y adquisiciones siguen siendo entre las opciones favoritas que tiene las empresas actualmente para crecer. Con la ayuda de la teoría de juegos, estas operaciones pueden ser mejoradas para que cuyos participantes tengan una ventaja competitiva.

El caso de la fusión entre Kraft y Heinz en el año 2015 se utiliza como referencia para entender la importancia de la correcta identificación del "juego" que se está jugando, así como la correcta aplicación de la teoría de juegos durante el proceso de negociación. El fallo en la

valuación de la compañía Kraft demuestra el efecto que tiene un incorrecto uso de la teoría de juegos y el impacto que tiene a largo plazo para estas operaciones.

Key Words

Game theory, mergers and acquisitions (M&A), Kraft, Heinz, cooperative games, non-cooperative games, extensive form, normal form

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i. Introduction

Game theory is not just a simple mathematical model, it is a theory that can be transposed into nearly all situations in the real world. The most famous example of game theory is the prisoner's dilemma; however, this just portrays a simplistic view on how one's actions affects everyone's outcome. A very relevant example can be seen in the valuation of companies at the time of mergers and acquisitions (M&A). Valuations can be done through various methods, discounting the cash flow, using the comparable method, options valuations, etc., but all of these offer different outcomes for the same company. Game theory allows the players - in this case the acquirer and the target company - to find the best strategy during negotiations to obtain the optimal price whilst also taking human action into consideration.

Using the practical case of the merge between Kraft and Heinz in 2015, this paper will describe how game theory applies to the decision-making process to obtain a final solution. The main goal of M&A is for both companies to achieve the best outcome possible, improving their previous position - when they competed. Analyzing the reasons behind the merger, why it was more beneficial to merge rather than continue competing in the food and beverage industry will allow the reader to understand the value behind game theory and its application to the financial world.

Motivations

Mathematics can be seen in every single aspect of nature even though we do not notice, and game theory is no exception. Game theory can be used to explain interactions within a society, how humans continuously "play games" with one another to obtain what they desire or need. People believe that game theory solely focuses on conscious strategic decisions, however humans use game theory in every single aspect of society, it was first used to describe how humans interacted and behaved, it suggested that social interactions are just like games: there are winners, losers, rewards, punishments, and strategies. The most famous example of the application of game theory is in the prisoner's dilemma, this example could easily be a real-world situation, but it is not the only example that could be used. In love triangles, game theory

could study how the suitors “play their cards” in order to obtain the love of that who they both desire, or even a more simplistic way, game theory could analyze how courtship works. Even politics can be analyzed using game theory, how politicians from different political parties interact with one another to obtain or eliminate the proposal in question. Its vast number of applications makes game theory a mathematical theory that should not be overlooked, it is very important to obtain the perfect equilibrium, this is why the author finds this topic intriguing, and decided to study game theory within M&A as economics is another subject of interest for the author. Looking at game theory from the perspective of M&A is a perfect example on how an appropriate application of game theory can lead to successful or unsuccessful results in real time over the short and long run. M&A is a very relevant topic in today’s world, as companies compete to become the number one in their respective industries through M&A, as it has become one of the market’s favorite ways for companies to grow, as it allows them obtain the benefits that this comes with.

Objectives

The main objective of this paper is to explain the importance of game theory in human interactions at the time of negotiations of M&A in order to obtain the best possible outcome for both parties in the long run. In order for the reader to follow appropriately with the theme, this paper has been divided into five key parts, the introduction - explaining the importance and reasons for the creation of this research paper, an overview of game theory, and overview of M&A, a final case study applying what has been previously described in the previous chapters and a final conclusion and reflection on the paper.

Game theory will be thoroughly explained, explaining its history, its components, and its types of games. This way the reader will be capable of fully understanding the significance of game theory from a practical perspective before introducing game theory in the real world. In order to put the reader into perspective in terms of M&A, a description and definition of these will be provided as well as an explanation on the types of M&A transactions and styles, as well as a description on the current M&A market and its trends in order to put the reader into perspective on the dynamics of the market.

An example of a real case will be used to theoretically demonstrate the effects of game theory and its applications. This case is the 2015 merger between Kraft Foods Group Inc. and H. J. Heinz Company, two giants in the food and beverage industry, especially in the United States that merged to become Kraft Heinz Company - the fifth largest company in the world in this market. A brief overview of their prior history will be done, and an analysis on the reasons why the merger was done as well as the consequences of that decision will be provided.

Methodology

This research paper has been elaborated using quantitative and qualitative research. Revising literature that will allow the reader to fully comprehend the essential concepts in terms of game theory as well as M&A. In the first part of the paper, an overview of what game theory is will be explained using theoretical literature and other types of sources such as articles as well as examples on game theory. This method will also be used to explain M&A and its components and the current M&A market. The last part of this paper will use a case study to further explain the importance of game theory when conducting negotiations. This case study has been chosen as it is an example on how the misuse of game theory can affect a seemingly successful merger. To obtain the data for this case a series of articles and other sources have been used.

ii. Game Theory

Game theory arises from the search to find an exact description of an agent who wants to obtain his maximum utility (Von Neuman & Morgenstern, 1944). The utility function measures the level at which an agent's needs are met, and utility maximization is the concept where individuals and organizations aim to obtain the highest possible level of satisfaction from their decisions.

The basis for game theory can be tracked back to the 17th century by mathematicians such as Leibniz (1646 - 1716) and Huygens (1629 - 1695). They were pioneers at the study of probability and returns (gains) of games, due to the popularity of gambling. These

mathematicians were focused on games that had some level of “luck” or “uncertainty” within, such as card games and dice games, where the outcome was not solely based on how players played. According to Rüdiger Campe in *The Game of Probability* (2013), “... Huygens’ work on games of chance came to form the mathematical basis for what would become probability theory in the modern sense of the world”. On the other hand, Leibniz, anticipated key concepts of game theory such as introducing the theory of “best possible worlds” and the concept of “mixed strategies” (Cirilo de Melo & Cussens, 2004).

The utility function was first brought up in the 18th century by Daniel Bernoulli, however, Blaise Pascal’s (1623 -1662) philosophical argument - Pascal’s wager - is often used as an example of decision theory and is still studied within the areas of philosophy and theology. Pascal’s wager argues why believing in God is rational, and not believing is irrational. Pascal considers a binomial world: either God exists or does not, and one can choose to believe or not. However, he argued that living a life believing or not believing gave the individual a certain level of utility (finite), but the reward of believing and being right was infinite, and the punishment of not believing and being wrong would also be infinite (Lengwiler, 2009).

In the 18th century, Daniel Bernoulli introduced the idea of individualized utility functions. In his book, *Exposition of a New Theory on the Measurement of Risk* (1754), published two centuries after his death, Bernoulli explains how different people will give a different value depending on how much it is worth for them - introducing the idea of utility. Overall, he argued that the value of a “gamble” should not only be based on its expected monetary value, but also on the usefulness (utility) of the outcome for the individual “playing” (Bernoulli, 1754).

Augustin A. Cournot (1801 – 1877) outlined his theory on perfect competition and monopolies in his 1838 book called *Researches Into Mathematical Principles of the Theory of Wealth*. Cournot created what is nowadays known as the Cournot Competition Model, an economic model that introduces the idea of strategic interactions in an oligopoly, where each firm’s decisions are affected by the others. An oligopoly can be defined as a market in which two or more companies provide a particular product or service, by competing with each other to obtain the highest possible profits and discourage lower prices. In Cournot’s model, each firm chooses its output level simultaneously depending on how much they believe the other

firms will produce. Cournot’s model became the grounds in which John Nash’s created his theory of Nash Equilibrium.

However, it was not until the 20th century that a formal foundation for game theory was laid down. Emile Borel could be recognized as the creator of modern game theory, which was later further developed by John von Neumann. Between 1921 and 1927, Borel published his notes on the theory of probability and its applications. In these notes, Borel re-introduces the idea of “mixed strategies”, as Leibniz had previously established (game strategy), where players in a game choose to act a certain way (among a certain number of choices) and the outcome of the game depends on the actions taken by all the players (Fréchet, 1953). Borel believed that game theory could be used not only within economical situations, but also for military tactics (Fréchet, 1953). Thomas Hamilton’s and Richard Mesic’s “*A Simple Game-Theoretic Approach to Suppression of Enemy Defenses and Other Time Critical Target Analyses*” (2004) uses game theory to analyze military tactics, specifically TCT operations (According to the U.S. Coast Guard, Team Coordination Training, a program aimed at studying and changing how we look at risk and work as teams). They explain how military planners can apply their principles to TCT operations through game theoretic analysis whereby, in order to determine the tactical operations available to each side, planners must assume the possible options that each side can choose between a range of possible actions, for example, the “Blue” side can either choose to fly a strike aircraft and get past the enemy’s air defenses and strike a target or just overview their opposition’s front, this means that “Red” can either engage and fire them, or decide not to engage. Analyst/planners must now assign a numerical value to each possible outcome, for example:

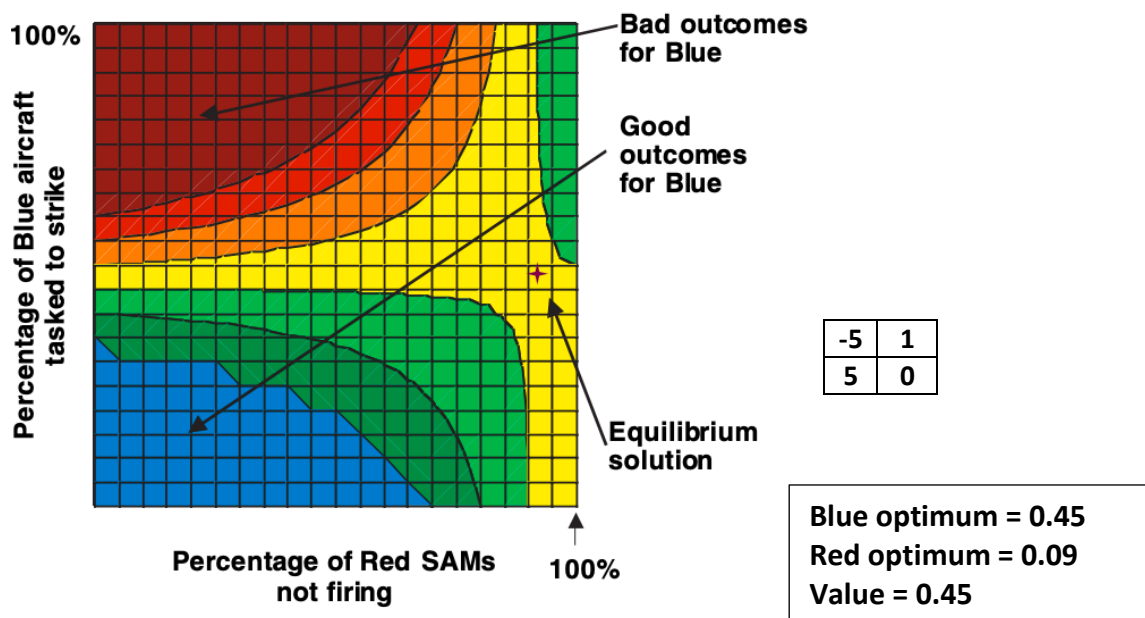
	Red engages	Red does not engage
Blue strikes	-5	1
Blue does not strike	5	0

Using the above matrix, analysts can calculate the possible strategies and their outcomes, calculating the results of each combination of strategies and obtaining each side’s optimum strategy - the “equilibrium” solution, *figure 1* shows the optimum strategy for each front. In this case, Blue’s optimum strategy is to fly and strike 45% of the time, whilst Red’s optimum strategy is to engage 9% of the time. If Red engages more often, Blue can change his

action and redirect his strategy towards the lower left corner by decreasing his strikes, and vice versa. Having found this, planners can see who gets the most favorable outcome, determining the expected result of the game. In the above case, It is true than in reality the arithmetic is more complex, as the available options are more than two, however, the principles are the same. In the example, the solution allows planners to assume that, if both sides are playing rationally and intelligently, Blue will have a positive result from the interaction, as well as noticing that Red is better off not engaging at all (Hamilton & Mesic, 2004).

Figure 1

Results of Each Combinations of Strategies



Note: The graph shows the outcomes of the different combination of strategies. It shows the percentage of the Blue striking and attacking Red, and the percentage of Red not engaging. From *A Simple Game-Theoretic Approach to Suppression of Enemy Defenses and Other Time Critical Target Analyses*, by Hamilton, T., & Mesic, R., (2004), RAND Corporation.

Additionally, Borel also commented on how information plays a part within game theory. In a game where players do not know what their opponents' choices will be, uncertainty plays a big role. In a game, each player aims to maximize their return, therefore by considering the other players' choices and sometimes consider the concept of "mixed strategies" (Biswas, 1997) - the player does not choose only one action, but instead a player randomizes between all his available actions.

It has been theorized that Borel laid the groundwork for the latter development of John von Neumann's first proof of the minimax theorem (Biswas, 1997), although von Neumann stated that he developed the theory independently of Borel, having no recollection of the existence of Borel's notes (Hoff Kjeldsen, 2001).

Neumann's minimax theorem is based on a strategic approach to game theory. Essentially, Neumann proved the theorem "Minimax" for a game involving two players who play against each other and where the gains of both players add up to zero (Hoff Kjeldsen, 2001) o (Neumann, 1928). Additionally, proving how players in every zero-summing, two-person game, also take into account the optimal "mixed strategies" involved in the game that could offer them the best return/smallest loss. To further explain this theorem, we can apply it to the rock-paper-scissors game. In rock-paper-scissors, two players simultaneously choose one of the three available options: rock, paper, or scissors. The outcome of the game depends on the combination of choices made by the players. A payoff matrix can be used to graphically represent the possible outcomes of the game.

		Player B		
		Rock	Paper	Scissors
Player A	Rock	0 , 0	- 1 , + 1	+ 1 , - 1
	Paper	+ 1 , - 1	0 , 0	- 1 , + 1
	Scissors	- 1 , + 1	+ 1 , - 1	0 , 0

The first number in each cell represents the payoff obtained by player A, whilst the second number represents player B's payoff. Positive numbers are gains, negative corresponds to losses and a zero represents a tie. This means that: Reward for Player B = - Reward for Player A, adding both to zero. In this game, pure strategies cannot be used to guarantee an advantage over the other player (all other things equal), as player play simultaneously and they both have an equal chance of winning, losing or tying. However, players can adopt a mixed strategy, giving equal probabilities of 1/3 to all the available options, making both players play the same mixed strategy.

However, the reality is that it was not until mathematician John von Neumann and economist Oskar Morgenstern published in 1944 the book *The Theory of Games and Economic Behavior* when game theory begun to be considered a serious and rigorous field. This publication became the overall landmark for game theory as, until then, the conceptual idea and concepts of game theory had not been fully formalized (Biswas, 1997). From there on,

game theory has continued to evolve. One of the latter developments on the concept of game theory has been the Nash equilibrium. Although this theory could be traced back to Cournot (1838), John Nash formulated the concept of the Nash equilibrium for non-cooperative games (Kreps, 1989). Nash equilibrium is an outcome in a noncooperative game with two or more players in which no players outcomes can be improved by changing one's own strategy. It defines the solution for N-player noncooperative games. Nash argues and proves why in the decision-making theorem, players can obtain their desired outcome if they only follow their optimal strategy and do not deviate from it. In this case, every single player obtains the desired outcome.

The Nash equilibrium attempts to mathematically determine the actions participants should take in a non-cooperative game to obtain the best outcome for all players. The importance of this concepts is due to its wide variety of applications such as, economics, politics, law, etc.

Overall, it can be argued that modern game theory could be considered to be based on three major publications, Cournot's competition model who allowed a formalization of Nash' Equilibrium, Emile Borel, with his notes on the theory of probability and introduction to mixed strategies and finally, the most known game theory critics, John von Neumann and Oskar Morgenstern.

Elements of a Game

There are a series of essential requirements for the game to exist. Conflict is the basis of any game, and a series of rules on how to act accordingly must also be known to those who are playing. The main goal of playing is winning - or obtaining the maximum reward or the lowest loss - maximizing their utility. Overall, players must take decisions (strategies) that best suits them to win, having to follow certain guidelines, and having other players that will affect their return outcome. Game theory rigorously analyzes these situations, their possible outcomes and the strategies taken by the players. Overall, the basic components in a game are: The players involved, the strategies available to each player, and the payoff received by each player (Gibson, 1994). However, a more in-depth list can be obtained when analyzing these (Perez, Cerdá & Jimeno, 2004)

- *Agents (players)*: Two or more participants that play the game, they make decisions, according to John von Neumann, in the most reasonable way possible. Their aim is to maximize their utility. Players within economic theory can be firms or any other sort of economic agent (for example, governments). We assume that players are rational, they choose their strategies in order to obtain the highest possible payoff given the strategy of rivals.
- *Actions*: The decisions players can make when it is their turn to play. Depending on the timing, their actions can be limited or infinite.
- *Strategy*: The overall combination/sum of all the actions of each player. Strategies are conditional to that of actions of other players, no matter whether they are cooperating or not. The best strategy for each player is based on what maximizes the player's utility.
- *Outcome*: Different ways in which the game can end. The result from the outcome goes hand in hand with specific consequences for each player.
- *Payoffs*: At the end of the game, depending on the players' outcomes they obtain a certain level of reward/loss. The significance that each player gives to that reward is the utility that the player obtains from the game and how they have played the game. This is the value that each player gives to the consequences of their specific outcome.
- *Forms*: Ways to describe a game, specifically its players, actions, and payments.
 - i. *Strategic Form (Normal Form)*: Organizes the description of the game in a matrix form, emphasizing players' strategies. This is done through a vector. The outcome is given depending on each vector of strategy of the player, given by the vector of utilities of the players enjoy from the outcome. Information is summarized using the players' strategies. Normal form is used to describe simultaneous move games, where players choose their strategy simultaneously. For example, flipping a coin and two players must choose head or tails at the same time.
 - ii. *Extensive Form*: The extensive form displays each individual player's strategy and outcome through a tree diagram, showing how the development of the game could go depending on the actions taken by the player to obtain the range of different outcomes. This diagram allows to see a complete picture on when it is each player's time to move, the previous information about past moves, what they can move

and the final payoffs. Extensive form is used to describe sequential games where players move sequentially, one player moves first, then another. An example of a sequential game would be chess, where players decide their next action based off the other player's previous action.

Utility Function

The utility function is another element within game theory. It is used to model an agent's interests. It quantifies each agent's degree of preference/satisfaction across a set of alternative outcomes and describes how the agent's preferences changes depending on the uncertainty about the outcome he will receive in the end. In other words, the utility function does not only aim to measure quantitative information, but also qualitative - happiness, worthiness, satisfaction, etc. It is assumed, that when agents act in both a certain and uncertain environment, they always act looking to maximize their utility - searching for optimal utility.

The formal mathematical definition of a strategic/normal form game is a game with a (finite, N-person) normal-form game by the tuple (N, A, u) , where:

- N is a finite set of n player, indexed by i , $i \in N = (1, 2, \dots, n)$
- $A = (A_1 * \dots * A_n)$, where A_i is a finite set of actions available to player i . Each vector $a = (a_1, \dots, a_n) \in A$ is called an action profile
- $u = (u_1, \dots, u_n)$ where $u_i: A \mapsto \mathbb{R}$ is a real-valued utility (or payoff) function for player i

Strategies must also be mentioned when talking about utility. As mentioned previously, players choose a specific action (or set of actions) based on the idea of maximizing their utility. Players could decide to play a pure strategy, which is when the player decides to select one single action and play it all throughout the game, or a mixed strategy, which is when a player decides to randomize over the set of available actions according to probability distributions.

The definition of mixed strategy for a normal form game is the following:

- s_i indexes the strategy that the player i might make
- $S = (S_1 * \dots * S_n)$, where S_i is a finite set of mixed strategies available to player i . Each vector $s = (s_1, \dots, s_n) \in S$ is called a strategy profile, hence, $s \in S$ specifies the strategy for each and every player in the game..
- For any set X , $\mathbb{III}(X)$ is the set of probability distributions over X . Meaning that the set of mixed strategies for player I is $S_i = \mathbb{III}(A_i)$

Continuing with the assumption made by von Neumann and Morgenstern (1944/1953), each player's preferences over a set of possible outcomes can be described by the utility function, each strategy profile $s \in S$ produces a certain outcome and right $u_i(s)$ for the player i associated to that outcome. Therefore, the normal form game can be explained by a set of strategies S_i and by the utility function:

$$u_i: S \mapsto \mathbb{R} \text{ hence } G = \langle S_i, \dots, S_n, u_1, \dots, u_n \rangle$$

In uncertain environments, an agent's utility is defined by the expected value of his utility function with respect to the appropriate probability distribution over the possible outcomes.

To calculate the expected utility, one must first calculate the probability of reaching each outcome given to the strategy profile of the agent, and then calculate the average of the payoffs of the outcomes, weighted by the probabilities of each outcome. The notation for expected utility (given a normal-form game) of a mixed strategy is as follows:

$$u_i(s) = \sum_{n=1}^{\infty} u_i(a) \prod s_j (a_j)$$

The expected utility u_i for player i of the mixed-strategy profiles $s = (S_1, \dots, S_n)$.

Extensive form games, as previously mentioned, are those where players' actions are sequential. Their strategies and outcomes can be represented by a tree diagram. The arcs of the tree diagram represent the different decisions that are possible from the last node, the nodes of the trees represent the outcome from a decision. The terminal nodes are those which are not

followed by another node, they represent the final outcome of a player's strategies and also represent the end of the game. Each outcome is associated to the utility of the player. The simplest form of this type of game are those with perfect information. An example of an extensive form game with perfect information would be chess. Players know where they are at, the movement decisions they can take at a specific stage in the game, and the previous moves (made by the other player and themselves) at that stage. They can only decide based on the last node (last outcome of the previous movement).

Types of Games

Within game theory there are various types of games. Their identification and explanation are relevant to understand the type of game one is playing, and to understand the type of game the case study is.

1. Cooperative & Non-Cooperative Games

Cooperative games are those in which agents create agreements, negotiate, and play together as an external force (such as a set of rules) forces them to cooperate with each other in order to "win", or obtain the overall maximum payoff possible through cooperation. These types of games are also known as coalition games where players can share their payoff and coordinate their strategies. In non-cooperative games players refuse to talk about their strategies with each other and decide to choose their own to maximize their own payoff. An example of a coalition game would be in the case of a joint venture, where companies join to form a group to obtain certain benefits, whereas an example of a non-cooperative game would be the prisoners dilemma.

2. Simultaneous & Sequential Games

Games can also be identified by the order of player's actions. Simultaneous games are those in which players move simultaneously, they do not know other players' moves, whilst in sequential games players are aware of their counter part's previous actions, but do not necessarily need to know other players' following strategy. Simultaneous games are represented through a normal form and sequential in extensive form. An example of a

simultaneous game would be rock-paper-scissors and an example of a sequential game would be tic-tac-toe.

3. Symmetric & Asymmetric Games

How players' strategies are adopted is also relevant when describing a game. In symmetric games players' strategies are the same, however this means that there is a limit - only short-term games can be symmetric as in long-term games available options of actions increases. The decisions in a symmetric game solely depend on the strategies used, not on the specific players of the game. This means that players could be interchangeable, as in, it does not matter who is playing, the payoff will not be affected. In asymmetric games the strategies adopted by the players is different, one strategy might provide a benefit to one player, but might not be as beneficial for the next. Decision making is not just solely based on strategies, but also on the available strategy and actions of the player. For example, the game chicken is a perfect example of a symmetric game: Two players run up against each other and they must decide to either swerving or keep riding and risk collision. If both players swerve, they avoid collision and receive a low payoff, if one swerves, they are pronounced "chicken" and receives a smaller payoff than that who has gone straight, if the payoff is either 0 or negative for both. An example of an asymmetric game would be the market, different firms take on different strategies to obtain customers.

4. Constant Sum, Zero-Sum & Non-Zero-Sum Games

Constant sum, zero-sum and non-zero-sum games depend on the outcomes of the players. Constant sum games are those in which the sum of the outcome of all players is constant even if the outcomes are different, zero-sum games are just a variation of these types of games. In zero sum games, the strategies of the players do not affect the overall outcome of all the players - which is always equal to zero. In zero sum games, the loss of one player is the win of another as the elements in the game cannot be neither increased nor decreased. An example of a zero-sum game would be poker, the amount of chips in the game is constant throughout the game, whatever one player wins, the other loses. Non-zero-sum games are those where the outcomes of all the players are not equal to zero, one's loss does not mean another player's win. Non-zero-sum games are usually cooperative, such as "Super Mario Bros" in multiplayer mode, players must work together to defeat each level, and even though one might obtain more points than another throughout the game, it does not mean that one loses due to

the other, they could both obtain different payoffs, but the overall outcomes is either the game's loss or win.

5. Perfect Information & Imperfect Information Games

In perfect information games, all players have all the same knowledge available to them, and this would be identical to that that would be available at the end of the game. Imperfect information games, players move without necessarily knowing everything - the past, present, and future. Perfect information games are also described as sequential games, as every player knows past player's moves whilst imperfect games can be simultaneous games, or simply in games where uncertainty is introduced and not all players have complete information about the game's state, or the actions taken or that could be taken by the other players. A perfect information game would be chess, players can directly see the pieces on the chess table. An example of imperfect information games would be card games where each player's cards are hidden from the rest.

These are most game differentiators within game theory. To analyze game theory application, one must first understand the type of game being played, as different games have different requirements and effects.

iii. Mergers & Acquisitions

M&A are key for external corporate expansion. As defined by Hampton (1989) "A merger is a combination of two or more businesses in which only one of the corporations survives". From this definition one can extrapolate that Hampton saw mergers as an $A + B = A$ or B or C , either one of the companies survives, or a new company arises from the integration of these companies. The problem with this definition is that it overlaps with that of an acquisition too. However, the legal and economical differences between a "takeover", "merger" and "acquisition" allow us to differentiate them accordingly. Takeovers and acquisitions are considered as such when a firm controls more than 50% of the "firm's", in a merger, two or more companies join to form a "new" legal entity (Piesse, Lee, Lin & Kuo, 2006). For these reasons, the differences between a merger and an acquisition are attributed

towards the ownership of the combined business, the management control, and the size of the individual companies' pre-transaction.

Mergers can be seen as companies coming together to join forces and agree to become one, by pooling resources, maintaining shareholder ownership (pre-transaction owners have a share post-transaction) and holding (to its best extent) top management positions post-transaction, that is, both companies work together to establish an appropriate management structure that combines both businesses (Coyle, 2000). Acquisitions however can be seen as more abrupt and violent. In an acquisition a company takes over the ownership and management control of another. Acquisitions occur when one company either controls a company's stocks, or a businesses' operations and its assets. From a legal standpoint, the buyer "swallows" the target company, and it ceases to exist (Giddy, 1991). Stockholders in the acquired company can exchange their stocks for that of the acquiring, becoming minority shareholders in the post-transaction company, however the norm for an acquisition is cash payments (Coyle, 2000).

In theory, mergers are between similar size companies, however the reality is that this does not happen very often. Acquisitions are the predominant case, and sometimes, part of deal's terms includes that the buyer proclaims that the action is a merger, even if legally it is considered an acquisition. Truthfully, the underlying difference on which denomination is used depends on how the purchase is considered - friendly (merger) or hostile (acquisition or takeover), overall depending on the level of communication and how it is perceived by the target company's board of directors, employees, and shareholders (Giddy, 1991).

Types of Mergers & Acquisitions

There are 5 types of merger/acquisition possibilities:

- Horizontal Integration: When a firm externally grows by acquiring/merging with another company in the same industry, at the same supply chain level.
- Upward Vertical Integration: When a firm externally grows by acquiring/merging with another in the same industry but at a higher level in the supply chain.
- Downward Vertical Integration: When a firm externally grows buy acquiring/merging with another in the same industry but at a lower level in the supply chain.

- Congeneric/Concentric Integration: Merge (or acquisition) of firms in the same industry with no mutual customers or suppliers.
- Conglomerate Integration: Firms that operate in different industries, with different suppliers and customers merge (or acquisition).

M&A can also be divided by the size and the type of legal identities the companies that participate are. A reverse takeover is the definition given to a small firm acquiring management control of a larger or more established entity with the goal of maintaining the acquired company's name to conserve to take advantage of the reputation of the established/larger company. A reverse merger is the definition for when a private company wants to become public and buys a publicly traded company to avoid the expense and time required for an Initial Public Offering (IPO).

M&A deals can also be classified are by the type of transaction which can be either strategic or financial. The goals of these acquirers are different, and their approach towards the M&A deal are fundamentally different. Strategic buyers are operating public or privately held companies who operate in a certain industry. They are often competitors, suppliers, or customers of the business, who want to follow through a horizontal or vertical integration deal - although this type of acquirer does not exclude congeneric or conglomerate integration. Their goal is to acquire a company whose products or services can fit in into their existing business, looking for synergy to consolidate their market share by either reducing their competition, entering a new market and/or by improving their product offerings through the merger/acquisition.

Financial acquirers are private equity (PE) firms, hedge funds, venture capitals (VC), and family investment offices. Their main focus is 1) the return on their investment, 2) invest their investors' funds into these company to support their growth, and 3) obtain a return on this investment later on, once the company has grown. The long-term plan for financial acquirers is different for each, some will continue to own these companies for perpetuity, others (most) sell their acquisitions once their return on investment is sufficient for them.

Lastly, another way to identify the type of M&A deal is through the payment method. M&A deals can be paid either through cash, equity or a combination of these two. The most common payment method is through equity in either the new entity (combination of the

companies) or the larger entity (acquirer). However, when the transaction is done through cash payments, it is probably because the acquirer believes that once synergies are realized, share value will increase due to the overall business potential. This is also why target companies prefer to be paid through stock options, so that they can later also benefit from the synergies created. The payment method choice allows us to see management's opinion on how the deal will go in the future.

Cash payments take various factors into consideration, the target company's debt requirements, the acquirer's debt responsibilities and capabilities, other bidder's existence, tax implications and the effect on the capital structure. In cash-free-debt-free deals (CFDF), the seller of the target company pays off any debt obligations and extracts all excess cash. From the seller's perspective, CFDF allows them to keep the excess cash, after paying their debt obligations, as well as keeping the "cash" amount that is on their balance sheet at the time of closing the deal. This means that the deal is debt-free from the acquirers stand point, as they do not need to realize the target company's debt. Most M&A deals are structured this way as it assumes that the seller is entitled to the existing generated cash. Also, it allows the seller to see the difference in valuation from different acquirer's (First Capital, 2018). In these deals, it is common for adjustments to be made to the amount of cash and debt left within the company in order to take advantage of tax benefits. From the buyer's point of view, this allows them to obtain full control of the target company, as well as eliminating all of the existing debt.

The deal could also be structured through stock as as payment option. This can benefit the buyer side as they do not have to realize the cash payments, not having to increase their debt. Additionally, due to inefficiencies in the market, market share valuation could be a determinant on the type of payment. If the acquirer's company is overvalued, the buyer will most probably try to pay through equity as the shares are seemingly priced higher than their real value. This means that the buyer is getting more for what they have than what they really should. However, if the stock is undervalued, they will most probably prefer to buy through cash payment as it would take more stock as they would be trading at a discount. This payment method also offers potential tax benefits (Palmer, 2021).

Motivations for Mergers & Acquisitions

M&A's main objective is creating shareholder value over a long-term period. Companies look to create value through a series of benefits that they aim to obtain from M&A. The following are a series of explanations to explain the takeover activities and the reasoning behind why they can create value.

- Efficiency Theory
- Market Power Hypothesis
- Diversification Hypothesis
- Information Hypothesis
- Bankruptcy Avoidance Hypothesis
- Accounting and Tax Effects

1. Efficiency Theory

This theory is also known as the synergy theory. Synergy is the combined power of two or more organizations whose effect is greater than the sum of their separate identities. This theory involves the combination and coordination of the efficient good parts of each company involved as well as disposing of the redundant and inefficient parts (Piesse, Lee, Lin & Kuo, 2006). Another consequence of synergy can be obtained by “operational” and “financial” economies of scale, often through take-overs (Brealy, 2001). Jensen and Ruback identified the operational economies of scale as the “potential reductions in production or distribution cost” (Jensen & Ruback, 1983), i.e. lower labor costs by eliminating and merging departments that perform similar tasks resulting in a more effective labor force at a lower cost or increased economies of scale through the purchase of higher volumes of raw materials. This reduction in costs could then be potentially passed on to consumers. Financial economies scale refer to the overall firm's ability to obtain lower marginal cost of debt and increased debt capacity as the newly formed entity has pooled both companies' resources and increased their financial capacity. This in turn makes the company become a new investment opportunity, attracting more investors.

2. Market Power Hypothesis

The term “power” does not only refer to increasing market share. It also refers to a company's ability to control the quality, price, life and supply of a product due to a company's

production scale and capacity (Piesse, Lee, Lin & Kuo, 2006). M&A allow companies to increase their market share over a larger geographical area, enlarging the effect that their supply provides to consumers. This theory is based on the economic theory of monopolies and oligopolies, whose aim is to increase financial reward and barriers to entry. This could be seen in, what is considered to be, the first “wave” of M&A, defined by UKEssays as “an intense period of merger activity in a particular sector or industry and last from a short period to a long time partly depending on the performance of the market and the participating companies.” From 1893 - 1904, manufacturing and transportation companies in the US begun merging in the search for power over their respective industries. This led to the enactment of the antitrust legislation applicable to horizontal integrations to avoid monopolistic activities and protect consumers as well as workers. These companies could take advantage of their power position within the economy and decide to provide low quality products at high prices and consumers would be forced to accept these. As stated in 1982 by Utton, “large firm’s power over prices in an individual market may no longer depend on its relative size in that market but on its overall size and financial strength (Utton, 1982, p. 90).”.

Although companies nowadays cannot become monopolies, they can increase their market power (and market share), by merging or acquiring another. The entity can now sell all of the products sold by the company’s pre-transaction under the same umbrella, eliminate one of the company’s products or/and tap into their increased resources to improve their production line. Additionally, this increase in market share allows the company to reach a wider audience.

3. Diversification Hypothesis

The diversification hypothesis can be used to explain conglomerate integration. Diversification can be used to reduce risk. Companies can reduce the risk of their operations by enlarging their production line to more areas so that they do not have to depend on only one industry/product/consumer. It is a widespread approach towards external growth as it offers companies to join new market shares quicker than if they were to create a new product. This also brings the advantage of already having a market share and a functioning product, meaning that the company does not have to develop nor market a new product as well as avoiding barriers of entry to the new industry.

4. Information Hypothesis

Information hypothesis could arise from how companies take advantage of the prospects that the market has when they gradually announce their possibility for a takeover. Share prices of firms involved in a merger or acquisition are revalued to what the market believes to value the overall synergy that they will have once they integrate. In “The rationale behind interfirm tender offers: information or synergy.” (1983), Bradley proposes two other alternatives to information hypothesis, the “kick-in-the-pants” hypothesis which refers to when a company begins to claim the possibility of being taken over and how the market revalues their stock prices as it is believed that management is looking for a higher-value offer. In this case, only the company who is being taken over is revalued. The second alternative is the “sitting-on-a-gold-mine” hypothesis. This hypothesis is based around the idea that the bidding company knows something that the public has probably overseen. A clear case of this would be Twentieth Century-Fox asset play in 1979 when they bought Pebble Beach. In 1976 Pebble Beach stock was valued at \$25 million, three years later, in May 1979, Twentieth Century-Fox bought out Pebble Beach for \$72 million, the day after, Twentieth Century-Fox sold Pebble Beach’s gravel pit (one of its main assets) for \$30 million. This pit was worth more than what investors were willing to pay in 1976, and Twentieth Century-Fox made an outstanding asset play as they recognized the value of this asset that had been overlooked by the whole market for years (Lynch & Rothchild, 1989).

5. Bankruptcy Avoidance Hypothesis

Although it is believed that companies that are in the edge of bankruptcy are probably the riskiest merger or acquisition due to the debt obligations that come along with them, it is also a motivation for a takeover or a merger. Financially unhealthy companies are usually not attractive to acquiring companies, however, buying a company out of insolvency can become an opportunity due to the assets, products, market share and potential tax benefits or synergies. An example of a bankruptcy avoidance merger is the 2023 UBS Group and Credit Suisse integration. Credit Suisse was at the edge of bankruptcy due to a liquidity problem UBS, Credit Suisse and the Swiss Government quickly brokered a deal over a tight deadline to avoid further losses, whereby the two bank giants merged on the 19th of March 2023 (Wallace & Brown, 2023).

6. Tax Effects

Tax structure can also be a motivation for M&A. Companies who generate high taxable income can be inclined to integrate with another that generates a substantial carry forward of tax-loss in order to decrease its total tax liability. Taxation can also be a motivation for cross-border M&A, a multinational company that operates in a country might be taxed higher than a national company, therefore, it might be financially beneficial for the acquirer to buy a national company to take advantage of the taxation difference and decrease its total tax liability. An example of a tax effect would be Amazon and their acquisition of Whole Foods back in 2017. Amazon was capable of offsetting Whole Food's tax loss, due to previous losses of that same year, and overall reduce Amazon's taxable income, resulting in significant tax savings.

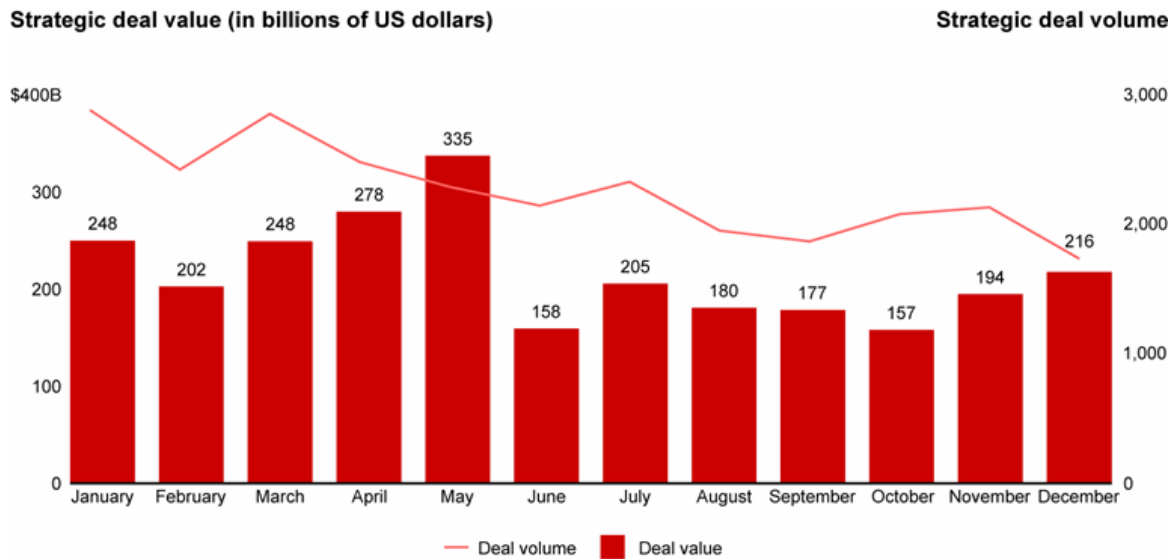
Current Situation of the M&A Market

Although the World Health Organization (WHO) has declared that the COVID-19 pandemic is no longer a global health emergency, the effect of the pandemic still has an impact on the M&A market, and the global economy in general. As the US Federal Government, the European Central Bank, and adjacent organization, fight rapid inflation rates, (9% and rising as of June 2022), due to the pandemic's aftermath, by increasing interest rates, added to the failure of banks such as Credit Suisse and Silicon Valley Bank, financing costs continue to rise, creating high amounts of volatility and uncertainty within the M&A market. However, this volatile and uncertain environment also brings up attractive valuations and opportunities for the market.

In 2021, once the worst of the pandemic had passed, the M&A market climbed sharply to a staggering 65,000 deals in the world, 9% above pre-pandemic levels and a record-breaking amount (PWC, 2022). However, in 2022, after a strong first quarter, throughout the year, M&A activity decreased, leading to a 32% decline in deal value in 2022 from its record high in 2021 (Harding, Grass, Grosshans, Kumar & Bhattacharya, 2023). This could be attributed to the increase in interest rates from the US Federal Reserve Bank in June 2022 and its effects on a global scale as well economic and political uncertainty. Deals that were over \$10 billion paused, and smaller deals decreased, however, although value decreased by 36%, volume only decreased by 12% (Harding, Grass, Grosshans, Kumar & Bhattacharya, 2023).

Figure 2

2022 Overall Strategic Deal Value and Volume by Month



Note: Total for year = strategic value total, strategic deals include corporate M&A and PE portfolio add-ons; categorizations based on deal technique, industry, and acquirer business description.
Source: Dealogic, 2023

The increased cost of capital along with geopolitical tension, inflation, and supply chain uncertainty created a more unstable and volatile environment as companies faced more risks from overseen variables. The effect these had on different types of M&A investors. Financial investors were greatly affected by interest rate increases as the cost of capital increased making their debt reliant model - leveraged buyout (LBO), buying a company using a combination of debt and equity. Due to this, they were highly exposed to the increased cost of debt. Strategic investors, however, have a broader bargaining power due to their available payment options, cash and equity, meaning that they were, at a certain level, shielded from the increase of interest rates.

Besides interest rates, investors have seen a series of offset during these past months. The trend of increased protection and scrutiny towards foreign direct investment has increased. The European Union has established FDI screening mechanisms to ensure information sharing and cooperation across all its partner states. The United Kingdom on the other hand, created a new National Security and Investment Act that allows the government to analyze deals in terms of national security, previously they could only do this based on public interest grounds (Morrison Foerster). In November 2022, the United States Department of Treasury established

their first-ever CFIUS Enforcement & Penalty Guidelines describing how CFIUS identifies, processes and assess violations of their guidelines which consist of mandatory filings indicating when a transaction occurs and mitigation requirements. These have added to the cost of deal making, as companies must now enforce these before taking part in any deal, especially international deals. Global exports have also been affected. The United States, EU and UK, along with other countries, responded against the Russian invasion of Ukraine with export controls against Russia. Additionally, the invasion of Ukraine has led to inflationary pressure in the price of food and energy. Russia and Ukraine account for 70% of the world's sunflower oil and 20% of the world's wheat production, which highly valuable agricultural products. Russia is also a key exporter of metals such as copper nickel, aluminum, and palladium. Shortages of these metals have affected supply chains as well as industrial production (Hintermann, 2022).

The recent banking crisis has also affected the M&A market negatively. The crisis which started with Silicon Valley Bank's collapse, spread to Europe to Credit Suisse, which ended up with a sales agreement between Swiss bank UBS, Credit Suisse and the Swiss government for the merge of Credit Suisse and UBS. This led to the pause and annihilation of many deals, not only for companies who operated through these banks, because the volatility and uncertainty of the banking sector. Overall, M&A deals dropped 44% in the US (to \$282.7 billion), 70% in Europe (to \$81.87 billion) and 29% in Asia Pacific (to \$176.1 billion). Additionally, it forced many PE firms to broker deals with higher equity checks due to the high cost of capital.

Overall, global deal making has slumped over the past quarter of 2023. After previous optimism of investment bankers, it seems that the sudden banking crisis has had a bigger effect than expected. In the first quarter of 2023, deal value slumped 48% \$575.1 billion, compared to 2022's first quarter value of \$1.1 trillion according to Dealogic.

Trends in Mergers & Acquisitions in 2023

The expected trends for 2023 due to the increased cost of debt financing, energy costs, uncertain economic environment and softening of consumer demand suggests the possibility of an increase of carve-out and spin-off deals. Carve-out deals are when a company sells a

portion of their business but might retain some relationship with the original business. This allows companies to raise capital through the sale of non-core capital. A spin-off is when a company creates a new independent entity, although ownership is maintained as it is given to existing shareholders. Both allow companies to focus on their main activities, allowing them to stream-line their operations and focus on their core business competencies as well as creating value.

Due to the volatile environment of the market, there is difficulty in company valuation. In order to avoid volatile valuations, it is probable that there are increased deals following an earn-out structure. Earn-out structured deals are a contingency payment agreement where the price of the business depends on future performance of the acquired company. Buyers agree to pay a portion of the purchase price, and the remainder depends on the success of the acquired company if they achieve certain goals (Morrison Foerster, 2023). This is beneficial for both parties as for the buyer it reduces risk of overpaying. For the seller, it gives them an incentive to improve their performance as well as help bridge the gap between what they aim to obtain and what the acquirer is willing to pay them. However, this structure could also lead to future problems if the target performance is not achieved.

Additionally, financial investors will probably impact the M&A market. Last year, PE capital investments within M&A accounted for 40% of deal values in 2022, changing the structure of the M&A market (PWC, 2022). As previously mentioned, financial investors look for value creation and optimization. Pricewaterhouse Cooper (2022) expected that PE investments increase this year as PE firms are now also obtaining other sources of capital such as credit-based to finance their investments, however, after the banking crisis earlier this year, this prediction will probably change. Venture Capital (VC) firms however, pulled back their investments in 2022, riskier investments were reassessed due to economic distress and the negative effects of their valuations (PWC, 2022). The most notable sector within VC investment affected has been early-stage business investments, but also applies to listed and late-stage companies. On the other hand, this means that competition for these investment opportunities decreased, allowing corporate and PE firms to have more leverage due to the difficulty for these businesses in obtaining funds. It is expected that as the year progresses, the VC market will have a comeback, and experience an increase in transactions in order to compete and reduce cash burn (Morrison Foerster, 2023).

Taking the current banking crisis into account, it is still expected that investing in the technology sector will still be the most attractive market. The growing role of technology and analytics placed tech-companies at the top of M&A deals and transactions specially within financial investors. Even though tech-stock performance in 2022 was comparatively worse than previous years, in 2022, Technology, Media and Telecommunications (TMT) investments dominated the sector, around 71% of deal volume, and 74% of deal value (PWC, 2023). It is estimated that PE investments will likely continue their interest on the sector, and continuous privatization transactions will happen as the year advances Also, corporates who are looking to improve their business offerings and technological capabilities are also large consumers within the tech-sector of M&A. A mega-deal that just occurred in the technology sector has been Silver Lake-Led Consortium's \$12 billion acquisition of Qualtrics International Inc this past quarter.

Morgan Stanley's investment bankers anticipate large, well-capitalized companies to go in the search for acquisitions that will add value to their core business, which could result in "hostile" transactions. The main sectors it is assumed that this will occur in are tech, as mentioned previously, healthcare and energy. Healthcare companies are now looking to expand after the pandemic. Many patents are expiring, meaning that they must replace these, which is why there has been a sudden increase in interest on biotechnology-based companies. As a matter of fact, the recent banking crisis did not stop Pfizer Inc's \$43 billion acquisition of cancer biotech Seagen, nor CVS Health Corp's \$10.6 billion takeover of Oak Street Health Inc, a primary care provider in the USA. The sky-rocketing gas and oil prices has led many on to the tracks of sustainable energy as well as the increased importance of Environmental Social and Corporate Governance (ESG) has increased business' interests on looking for companies who can improve their ESG impacts and goals. For this reason, many energy companies are looking at M&A as a way to achieve their scaling and product offering goals.

Lastly, cross-border M&A is expected to rise. Due to the pandemic and trade tension during the last year, cross-regional M&A saw a decline in 2022 from 16% in 2021 to 13% in 2022. As the impact of these diminishes, cross-border activity should increase in the next two years as companies seek to increase their globalization by expanding their supply-chain and available markets.

Game Theory Applied to M&A

As it has been mentioned throughout this paper, game theory studies the strategic interactions between rational decision-makers, this includes corporations, and for so, M&A. M&A is one of the strategic alternatives a corporation's management can use to externally grow and achieve its growth targets. Various game theoretical models have been used to describe these types of transactions, specifically in the context of company valuation. Within M&A, corporations are the basic unit, for this reason, the transaction can only occur when the expected total revenue is more than the total cost of payment. This means that M&A is based on corporations' own interests, which can be affected by the overall market, industry, competition, expected revenues, future costs, etc. M&A transactions are sought to be non-cooperative games, since player's valuations are independent from one another, and they each look to maximize their own payoff, independently. Although, there is a difference in negotiation between friendly and hostile takeovers. In friendly takeovers, the acquiring agent may bargain with the target shareholders, using the management team as the negotiating agent, whilst in a hostile takeover, negotiations usually take place with the shareholders, skipping management.

Abraham Moskovicz (2018) describes the pricing of M&A transactions as: "successful transactions should show a reasonable proportion between the return/gain likely to incur and the investment amount. Mergers can be successful when the price to be paid by the acquiring company to the target firm is based on a realistic amount that is in viable proportion to the tangible and intangible returns as well". Roy (1989) argued that M&A was based on bargaining, he modelled a corporate takeover as a bargaining game under uncertainty about the target company's minimum price. The uncertainty and difference in valuation techniques creates disagreement between the target company and the acquiring company. Roy created a model to represent the target's minimum acceptable price through a probability distribution, to give guidance on the optimal bargaining strategies during a takeover (Van den Honert, 1995).

Valuation techniques can either be based on "Direct Methods", which involves on the target company's present and expected cash-flows, or direct methods relying other variables such as revenues or earnings, these methods estimate the company's fundamental value, whilst "Indirect Methods" can also rely either on cash flows or other variables providing a fair price

with respect to a benchmark or to its peers (Moskovicz, 2018). The difference in valuation techniques can be useful to identify a basis for negotiations, and from there one, corporations can begin the bargaining processes to find a common satisfactory price. In this stage, M&A transactions can be thought as a multi-stage, multi-party bargaining game. The players are the acquiring and the target company, and the stages/actions are the offers made by the acquiring company and the reaction of the target company. The game reaches its end once an offer is accepted or once one of the parties decides to leave the game (no takeover occurs): The optimal final payoff for the target company is the final price accepted and the payoff for the acquiring company the target company itself and its expected future value. In real M&A cases, valuation also differs due to asymmetric and imperfect information between the target and the acquirer, making negotiations more dynamic.

iv. Kraft and Heinz

In this following section, a brief overview of a real life case study will be used to further explain game theory within M&A. The case in question will be the 2015 merger between Kraft Foods Incorporated and H. J. Heinz Company, two food processing and manufacturing multinational companies that resulted in the Kraft Heinz Company and becoming the third largest food and beverage company in North America, and the fifth in the world. This case will allow the reader to understand the application of game theory throughout the negotiation process.

Before getting into further detail, a brief overview on both companies will be provided.

Kraft Foods Incorporated

Founded in 1903 in Chicago, Illinois, and originally named “J. L. Kraft & Bros Co.”, Kraft’s main product was processed cheese, specifically becoming pioneers in spoil-resistant

processed cheese, and making it its core product and very successful during World War I within American fronts.

Over the years they expanded through various partnerships and acquisitions; in 1930, National Dairy Production Corporations acquired J. L. Kraft & Bros Co. and renamed the brand as Kraftco Corporation in 1969, and once again as Kraft, Inc. in 1976, this begun a series of acquisitions and transactions that ended up in their final merger (prior to Heinz) between General Foods and Kraft to become Kraft General Foods, Inc. in 2001. They also expanded by increasing their product portfolio, by venturing into other consumption categories such as snacks, beverages, and grocery items. Some of their most popular products being Kraft cheese, Milka and Toblerone chocolates, Kool-Aid, Philadelphia cream cheese, Oscar Mayer meats and Cadbury chocolates, all of these are well-recognized products world-wide.

Prior to their merger in 2015 with Heinz, Kraft underwent a split in 2012, between their North American grocery product offerings, becoming Kraft Foods Group and their global snacks product offerings as Mondelez International. Allowing them to solely focus and succeed in their specific markets.

H. J. Heinz Company

Heinz dates back to 1869, when Henry John Heinz founded the company in Sharpsburg, Pennsylvania. They began selling horseradish in clear glass bottles, an innovative packaging concept for that time, making Henry Heinz an entrepreneur. Over the years, the company expanded its product offerings to other condiments and preserves as well as opened new branches and factories throughout the United States, as well as England and Spain by 1905, making it the largest producer of pickles, vinegar, and ketchup in the United States. Additionally, Henry Heinz was a progressive employer for its time, he was acclaimed for his innovative and liberal attitude towards its employees as well as lobbying in favor of the Pure Food and Drug Act of 1906.

The company went public in 1946 but continued to be managed by members of the Heinz family until 1969. By this time, the H. J. Heinz Company was a multinational corporation, whose products eventually reached over 200 countries, and continually grew over

the 21st century by further acquiring food-processing companies and establishing subsidiaries in China, Africa and central and eastern Europe and the Pacific Rim.

Heinz's most iconic product offering is their ketchup, which is globally recognized and has become a staple in most households across the United States as well as being the main ketchup offering in many fast-food chains. However, Heinz is also very well-known for their many other sauces and condiments, as well as their production of baby food, frozen meals and snacks.

Motivations for the Merge

In the beginning of 2015, Heinz and Kraft announced their merger agreement to become The Kraft Heinz Company. The deal was completed by July of that same year, with support of investment firms 3G Capital and Berkshire Hathaway as key investors and financial backing of the acquisition as well as offering their expertise pre- and post-transaction, these had previously bought Heinz back in 2013 and since their acquisition of Heinz, 3G Capital and Berkshire Hathaway were actively seeking merging opportunities to further expand the Heinz brand. The Brazilian private equity titan 3G Capital was known for its investment and restructuring strategies, and was looking for a potential match for Heinz, in search for synergies and growth opportunities through a merger with another food company, which eventually led to the merger between Kraft and Heinz.

The unanimously approved agreement made Heinz's shareholders own a 51% stake in the combined entity and Kraft's shareholders the remaining 49%, as well as obtaining a special cash dividend of \$16.50 per share. This cash payment of approximately \$10 billion was fully funded by the equity contribution of the investment firms previously mentioned. Together, Kraft Heinz Company owned eight +\$1 billion worth brands, and five \$500 million to \$1 billion worth brands. Making it an opportunity for potential synergies and investment opportunity within marketing and innovation.

Both companies had successful growth stories, but still sought aggressive expansion strategies through acquisition of other companies such as French Groupe Danone, Australian

Golden Circle and English Cadbury. Their direct market overlap and competition made them attractive acquisition opportunities for one another, and ultimately made sense.

The potential synergies and cost savings that would be acquired through this merger would improve efficiency and overall increase profitability of the combined entity. This is due to the efficiency theory, as they could combine their operations and streamline their supply chains as well as eliminate duplicates and obtain larger economies of scale. Overall, their initial estimated potential synergy annual cost savings was \$1.5 billion implemented at the end of 2017 from the shared economies of scales, increased efficiency, and cost reductions. An accounting advantage and cost saving that Heinz obtained from this merger is Kraft's higher credit rating, Heinz could now refinance its high-yielding debt, and replace it with low-yielding investment-grade debt, overall helping reduce the total cost of capital for the combined entity (Forbes, 2022).

Another reason for the merger was the increased market power and competitive advantage that the combined entity would have. Kraft Heinz Company would become the third largest food and beverage corporation in the USA, and the fifth largest in the world, making it a stronger and more competitive player in their respective markets. Motivated by the market power theory, the combined entity could now sell all of their products under the same umbrella and tap into the increased resources to improve both companies' production lines, leverage their existing distribution networks, as well as having increased market share that reached a larger audience and enter new markets on a wider scale. The combined entity would have a larger global presence, they could now take advantage of the market power for increased bargaining opportunities with retail outlets, restaurants and food companies.

Following into the diversification hypothesis, even though both companies did overlap within the food and beverage industry, they both succeeded in different sectors. Kraft Foods had strong presence within the grocery sector, specifically in packaged food products, whilst Heinz focused primarily on condiments, sauces, frozen foods and baby foods. This merger allowed the combined entity to offer a broader range of already successful products through various categories within the same industry, increasing their customer base and expanding their market reach in comparison to the original two entities.

Additionally, although Kraft had global presence prior to the merger, its main market was based in North America - 98% of their sales came from North America. They had operations and product distributions in various countries, and they reached international markets, however, Heinz had a larger foot on the international markets - 60% of their sales came from other regions apart from North America, they were known for their extensive international operations and footprint in various countries apart from the United States. Their brands had global recognition and trust, and Heinz offered localized products that fit into local tastes and preferences, for example, Heinz's Bajan Style Sauce is a Caribbean-inspired sauce that is specifically targeted towards the Caribbean market region. Although it might be sold in other countries, their focus and availability rely on this specific region as it blends in perfectly with the Caribbean culinary taste and culture. The combined entity could now take advantage of Kraft's big name products and sell them in the international market, products such as Velveeta, Lunchables and Planters, as Kraft Heinz Company had complete knowledge on how to successfully do this following previous product launchings and how to globalize products.

Game Theory Approach

Considering the merger with the strategic interactions between both companies and the decision-making processes, we can analyze the merger through a game theory approach. Game theory, as mentioned throughout this paper, allows us to understand the decision-making process and how each player - Kraft and Heinz - strategically acted to maximize their outcomes.

The players of the game were Kraft Foods Incorporated and H. J. Heinz Company, they were both looking to expand their companies to increase their market share, revenues, and profits. They both had global presence, acted in the food and beverage industry and were large players in their respective sectors. Their decision to combine forces was a strategic move, as they believed that the potential benefits of a merger would outweigh the potential losses. They both were recognizable and trusted brands that could benefit from each other's resources, brands, and distributions to reduce costs, increase revenues, expand their market share, and improve their economies of scale as well as market power. It must be mentioned that in this game, Heinz is the acquiring company, looking to horizontally integrate with the target company, Kraft. Although they merged, in the end, Heinz, specifically its owners, 3G Capital and Berkshire Hathaway, paid Kraft's shareholders through a combination of cash and equity.

Kraft's main goal during negotiations (the game) was to maximize shareholder value, obtain a favorable deal and ensure the company's growth long-term. Heinz's main objective was to expand its market power, obtain synergies, increase its global presence, and obtain a favorable deal for its shareholders to increase the company's value.

In just a span of 10-weeks, an unusual short amount of time for this class of multi-billion-dollar deal, both companies agreed to merge for a value of \$46 billion, orchestrated between the investment firms 3G Capital and Berkshire Hathaway who represented Heinz, and Kraft's own management, executives and legal advisors. It has been reported that 3G Capital was very persistent when negotiating and put pressure on Kraft to make a final decision as quickly as possible as although they believed Kraft was the best fit for a merger, they were also prepared to look for other opportunities. The negotiations considered Kraft's current market price, potential synergies created from the merger, valuation, operational integration (distribution, production, etc.), risks, regulations, and governance structures and how to redefine these.

In this case, the author has assumed the following: The merger was a cooperative game as the players formed a coalition to achieve a mutually beneficial agreement. However, mergers are still considered to be imperfect information games as during negotiations, both parties try to gather as much information on the other as possible to create an appropriate valuation, however, the parties involved in a merger might not fully disclose all of the available information and this can influence the outcome of the game. In this case, both Kraft and Heinz had to reach an agreement on Kraft's valuation whilst also dealing with imperfect competition and trying to overcome it throughout the process.

The "game's" payoff was based on the final agreement between both companies on Kraft's valuation. Both companies agreed on a \$85 - \$90 a share valuation of Kraft, around \$46 billion dollar in value, which included the dividend payout of \$16.50 per share as well as a premium for Kraft's shareholders. In the end, Kraft shareholders were also owners of 49% of the combined entity and had a one-to-one conversion of their shares, as so did Heinz's shareholders. Overall, the payoffs and outcome from this merger was the expected realization of synergies such as cost savings, operational efficiencies, economies of scales - which, as previously mentioned, were expected to be \$1.5 billion annually, as well as the increased

shareholder value created by the increase profitability, market power and share growth expectations.

Aftermath

The creation of The Kraft Heinz Company has been subject to mixed feelings. Although, as mentioned previously, the logic behind the merger made sense and was backed by each company's success, revenues and track records, the overall outcome of the merger has been influenced by a series of factors that have affected its success.

Initially, the combined entity had an overall \$28 billion annual revenue and controlled multiple food and beverage global brands, they captured some of the expected synergies and they did report revenue growth as well as achieving cost savings through increased operational efficiency and supply chain optimization. They also aimed towards aligning their brand portfolio as well as combining their distribution network and marketing capabilities. In the early days of 2016, The Kraft Heinz Company stock dipped below \$73 per share but peaked in February 2017 as synergies were realized, and they reported better-than-expected earnings, launching the stock price at a soaring \$96 per share. Investors were happy, although workers in the combined entity were not, due to the slashing savings and adjustments that had to be made to obtain these.

However, not long after that, once cutting costs was no longer a solution, challenges arose. Changing consumer preferences became an obstacle as demand for healthier and organic options rose, none of these being neither Kraft's nor Heinz's core product offerings, this in turn made revenue growth slower than expected. Their product offerings were still popular, but they did not dominate the food and beverage industry as they used to. This was made clear to investors as since its peak in February 2017, the stock price began to gradually fall until shares traded under \$50 by Christmas 2018, this meant that market capitalization had decreased by half in less than two years. The last quarter of 2018 was nefarious for the food giant. Sales only grew by just 1%, and the expected \$7.5 billion in revenue was not achieved, Kraft Heinz did not even surpass \$6.5 billion in sales. Also, that same quarter, they recorded \$12.6 billion in losses, and by the 29th of December 2018, their debt had amounted to \$31 billion (Pitchbook, 2023).

Another major setback for the Kraft Heinz Company was the \$15.4 billion write-down in February 2019, which also forced dividends to be cut by a third, and a further asset write down of \$1.22 billion in August of that same year, specifically from their Kraft and Oscar Mayer brands. The write-downs on the value of their brands and assets was due to initial overvaluation and accounting malpractices. This led to the company announcing of being under SEC investigation over their accounting practices. Overall, in just one day, the company's stock plummeted by 27%, losing \$16 billion of their market value.

Post-Transaction: Successful or not

In the very short run, Kraft Heinz achieved shocking cost savings and synergies thanks to extreme slashing of costs. However, the error the players made is very common within M&A, both overvalued Kraft's original worth, sequentially overvaluing the combined entity's worth, forcing them in February 2019 a write-down of their assets' and brands' worth. This is a clear example of misinformation within the M&A game, in this case, Kraft's shareholders obtained much more for what their company was worth, however, the downturn to this action negatively affected not only Heinz's shareholders, but it has also affected those original Kraft shareholders that stayed during the aftermath, for this reason, the game played in this case was not a zero-sum case, even though during negotiations, Kraft shareholder's might've acted as if it was, and in turn ended up damaging themselves too in the long-run.

A comment made by Unilever Chief Executive Officer in 2017, a British multinational of consumer goods, with 400 brand names in over 190 countries, when The Kraft Heinz Company made an offer to acquire them for \$143 billion just two years after the Kraft-Heinz merger, clearly shows how unprepared 3G Capital and Berkshire Hathaway were for this level of responsibility within the food and beverage industry "In practice, the prime mover was a Brazilian private equity firm, 3G, with a reputation for deep cost-cutting and single-minded focus on shareholder value ... Kraft Heinz doesn't need another acquisition to drive profitable growth for the long term". 3G Capital was obstinate on Heinz's rapid inorganic growth through fast paced acquisitions which overall would only be successful in the short run by quickly creating shareholder value, but not maintaining it. Their lack of knowledge in the industry was quickly realized when the time to produce in the dynamic and consumer changing industry

came, and sales were affected. Also, due to the desire to abruptly increase shareholder value, rapid valuations were done, and accounting malpractices overlooked. This is proof that appropriately applying game theory is so important in the negotiations stage. Overall, none of the players obtained the desired outcome in the long run as their decision processes was not up to the standard of finding the correct equilibrium as players did not “play optimally”, neither Kraft nor Heinz played accordingly to their game’s dimension - a cooperative game with imperfect information. Kraft and Heinz overvalued the company’s worth due to the failure to overcome the information asymmetry between each other, costing them billions in the long run. As mentioned in previous sections, the acquisition made sense on paper, however appropriate discussions, following game theoretical models had to be made to obtain a positive outcome for both players as well as an appropriate management post-transaction. It is not sufficient to slash costs to obtain long-term success, a much thoughtful strategy should be implemented to stay at the top of the market race.

v. Conclusion on Game Theory Applications

Game theory can be applied to every single aspect of society, and M&A is no exception. This theory aims to model the interactions that rational “players” in a “game” make to obtain their final “goal”, which in turn can give them a certain “payoff” which they value depending on their utility function. Its importance within M&A is relatively unknown, however it is vital to find the optimal equilibrium during these negotiations, and those who do know about game theory, can use it as competitive advantage during negotiations. M&A operations are vital for companies who look to externally grow. These operations are aimed towards creating synergies as well as the financial gain provided by the transaction and applying game theory appropriately can lead to successful implementation of those synergies, but most importantly to the realization of capital gains.

Translated into M&A, there are various games that could be played, they all depend on what the players are looking for, who they are, how many there are, the economic situation, etc. In the case study provided, although Kraft was the target company, both Heinz and Kraft had a shared goal: create shareholder value by merging into one single and bigger entity in order to obtain the synergies and market power that this would entail. This awaited merge between two titans in the food and beverage industry was estimated to be a complete success,

in fact they estimated a \$1.5 billion reduction in costs per year due to the operational synergies that this transaction would obtain, moreover, Kraft's shareholders received a \$16.50 per dividend cash payment and a one-to-one conversion of their shares for the combined entity. The expectation for the combined entity was large returns, decreased costs, increased profits, increased market share and power. The failure of both entities to properly identify the type of "game" they were playing became fatal as time passed, as their application of game theory within the negotiation stage was clearly inexistant. The fast-paced transaction left many holes during negotiations that were uncovered afterwards, the end result was negative as the market value of the combined entity since 2019 until now is inferior as to that of both entities separated back in 2015.

The case clearly reflects a lack of game theory application during negotiations that resulted in a long-run failure in the "game" for both players whose main objective was to grow, the players did not behave optimally according to game theory, they did not identify appropriately the type of game they were playing - a cooperative imperfect information game, which is why the valuation of Kraft was not in equilibrium with the real price - forcing them to make latter adjustments in February 2019 by writing-down their brand's worth by \$15.4 billion. Additionally, the Heinz's management team (specifically 3G Capital) strategy was short-sighted, their goal was to obtain quick synergies that could allow them to obtain cost savings but did not look for the perpetuity of the combined entity overall. It is true that it could be argued that The Kraft Heinz Company "sells itself", however the lack of internal growth within the company allowed room for competition to win their place over. The Kraft Heinz Company seemed to be a promising entity, however due to the lack of appropriate collaboration between both companies to obtain symmetry between the transfer of information when negotiating, Kraft was overvalued, and ended up affecting all shareholders as both Kraft's and Heinz's shareholders had a stake in the combined entity.

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