

Game Theory and Strategic Management: Navigating the Usefulness of Game-Theoretic Tools in a Dynamic Corporate Environment

Oyun Teorisi ve Strateji Yönetimi: Stratejik Yönetimin Dinamik Alanı için Oyun Teorisi Araçlarının Kullanışlılığına Rehberlik Etmek

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ÖZET

Makale, stratejik yönetim alanı ile oyun teorisi arasındaki ilişkiyi ve oyun teorisi araçlarının ve kurallarının stratejik karar alma sürecinde yöneticilere nasıl rehberlik edebileceğini incelemektedir. Pazardaki rakipler arasındaki karmaşık karşılıklı bağımlılık ve kurumsal dünyanın sürekli dinamizmi göz önüne alındığında, bu makale, iki alanın tarihsel gelişimini inceleyerek ve aralarındaki bağlantıyı ele alan literatürü inceleyerek, şirketlerin faydalarını en üst düzeye çıkarmaya yardımcı olan etkili stratejilerin seçiminde oyun teorisi araçlarının yararlılığını araştırmaktadır. Bahsedilen iki kavram arasındaki ilişkiyi daha iyi anlayabilmek için tarihsel gelişimin incelenmesinin yanı sıra, R programlama dili kullanılarak ikili bir pazarın simülasyonu yapılmıştır. Ayrıca oyun teorisinin kullanıldığı pazarlama stratejilerinin sonuçları ile şirketlerin pazardaki rekabeti göz önünde bulundurmadan bağımsız olarak karar verdikleri diğer pazarlama stratejilerinin sonuçları arasındaki fark, veri görselleştirmesi kullanılarak net bir şekilde gösterilmiştir. Çalışma, kararlar oyun teorisi ilkeleri, özellikle de mahkumun ikilemi çerçevesinden türetilenler kullanılarak alındığında, piyasa sonuçlarının sürekli olarak daha olumlu olduğunu göstermiştir. Bu, iki rakibin agresif veya muhafazakâr pazarlama stratejileri benimsediği düopolist bir pazarın simülasyonu ile başarıldı. R Studio'da yürütülen simülasyonlar, her iki oyuncunun da rakiplerinin beklenen tepkilerini ve stratejik öngörülerini hesaba kattıklarında daha büyük ortalama pazar paylarına sahip olduğunu gösterdi. Bu bulgular, rakiplerin davranışlarının birbiriyle yakından ilişkili olduğu sektörlerde oyun teorisinin önemini vurgulamaktadır.

Anahtar Kelimeler:

Oyun Teorisi,
Stratejik Yönetim,
Stratejik Karar Verme,

ABSTRACT

This article examines the relationship between strategic management and game theory, and how game-theoretic tools can guide strategic decision-making. Considering the interdependence between competitors and the dynamism of the corporate world, the article explores how game-theoretic tools help in selecting effective strategies that maximize company outcomes. It does so by reviewing the historical development of both fields and examining relevant literature on their intersection. To further explore the relationship between the two concepts, an R-based simulation is employed to compare the outcomes of game-theoretic strategies with those formed independently by firms, without accounting for competition. The study showed that when decisions were made using game-theoretic principles, specifically those derived from the prisoner's dilemma framework, market outcomes were consistently more favorable. This was achieved by simulating a duopolistic market with two competitors adopting either aggressive or conservative marketing strategies. The simulations run in R Studio showed that both players had larger average market shares when they took into account their competitors' expected reactions and strategic foresight. These findings highlight the importance of game theory in sectors where the behavior of rivals is highly interrelated.

Keywords:

Game Theory,
Strategic Management,
Strategic Decision Making,

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1. INTRODUCTION

Dixit and Nalebuff (2013:2-4) state that game theory is a branch of social science that studies strategic decision-making. According to Osborne (2004) its main goal is to help understand situations where decision-makers interact. It is fair to note that a “*competitive activity with a set of rules that should be respected by the involved players*” is what is generally referred to as “*game*”, but game theory extends beyond that. In the business context, the primary focus of game theory is providing guidance to the decision-making process and emphasizing its application to real-world situations where interactions and strategic decision making occur.

To examine how the definition of strategic management has evolved over time, Bracker (1980:219–224) notes that the word “*strategy*” originates from the Greek word “*strategos*”, which means “*to plan the destruction of one’s enemy though the effective use of resources*”. In the beginning, strategy was only used in the fields of politics and military, but later it was also applied in the field of business and evolved into the concept of strategic management. One of the earliest definitions of strategy dates back to 1947, where it was described as a series of actions decided by a firm according to the situation, to become later defined as follow: strategy provides directional cues to an organization that permit it to achieve its objectives, while responding to the opportunities and threats in its environment.

Taking into consideration the dynamism and complexity of the current business landscape as well as the interdependence between companies Oberholzer-gee and Yao (2007) highlights the potential of game theory to address challenges of the business world. This article’s main goal is to show that game theory can be a useful tool to guide strategic decision-makers to provide suitable solutions for the dynamism of the business landscape. This article examines the relationship between strategic management and game theory, and how game-theoretic tools can guide strategic decision-making. onsidering the interdependence between competitors and the dynamism of the corporate world, the article explores how game-theoretic tools help in selecting effective strategies that maximize company outcomes. It does so by reviewing the historical development of both fields and examining relevant literature on their intersection. To further explore the relationship between the two concepts, an R-based simulation is employed to compare the outcomes of game-theoretic strategies with those formed independently by firms, without accounting for competition.

2. LITTERATURE REVIEW

Game theory is defined as the study of decision problems involving multiple decision makers, where the quality of a decision maker's choice depends on both that choice and the choices of other decision makers. Originally developed as a mathematical model in economics, game theory has been widely applied across various disciplines to examine human decision-making behavior. Generally, game theory can be defined as the theory of decision makers maximizing their own gains to achieve better outcomes under specific competing strategies, assuming all competitors are rational (Arslan and Çetin, 2021:440).

Game theory provides a framework for analyzing decision making in real-life scenarios, especially complex and interactive strategies to make the most beneficial choices possible (Ahmad et al., 2023:2). Exploring the relationship between game theory and strategy management has always attracted many scholars, the link between these two fields is an interesting area of study. To better understand how game theory contributes to effective strategy formulation, it is useful to examine the historical development of both concepts. By following their development over time, a better understanding of how the strategy field was shaped and how game theory can play an important role within it.

Bracker (1980:219-224) focused on how the concept of strategy developed into strategic management, as well as the evolution of the different definitions given to strategy within business. The roots of the word strategy come from the word “*stratego*”, a general, which in turns comes from roots meaning “*army*”, “*lead*”. So, the word “*stratego*” means “*to plan the destruction of one’s enemy through the effective use of resources*”.

At first, strategy was mainly used in the political and military sectors, the strategic concepts developed by writers such as Montesquieu, Kant and Shakespeare were later used by many militarists and political theorists like Machiavelli, Napoleon, and Hitler.

The commencement of applying strategic principles into the business field started when Socrates drew parallels between the duties of a military general with those of a businessman. However, his view didn’t gain much popularity and only rose again during the industrial revolution. Businesses during that period had known a lot of

change and went from operating in a stable environment to a rapidly changing and extremely competitive, so, the need of companies for a strategy to deal with a new environment characterized by competitiveness and uncertainty became greater. That is how modern writers started developing the concept of strategic management. This also explains the evolution of the definition of strategy, in 1947, Von Neuman and Morgenstern defined strategy as follows: *Strategy is a series of actions by a firm that are decided on according to the situation*. Many other definitions for strategy were developed, the last one mentioned by Bracker (1980:219-224) is in 1977 by McNichols, *strategy is embedded in policy formulation: It comprises a series of decisions reflecting the determination of basic business objectives and the utilization of skills and resources to attain these goals*.

The development of the definition given to strategy demonstrates that it has a characteristic related to the environment, strategy uses environmental analysis to determine an organization's position in the market and make sure to use the available resources in an appropriate way to attain the organization's objectives. The authors have also mentioned that the development of the definition of strategy went from focusing on the macro level of the business (during the Greek time) to a micro level to enhance the internal operations and management and back to macro again, where the focus is mainly on the external environment.

In the digital era, Kitsios and Kamariotou (2021) evaluate the relationship between the use of artificial intelligence (AI) and corporate strategy and note the important role that AI technologies play for businesses. In addition, the article highlights the growing interest among researchers in leveraging AI to create a business strategy that ensures competitive advantage using predictive analytics and decision support systems.

The article's findings put forward the considerable benefit of artificial intelligence in strategy creation, however this context is not well explored, and more research can be conducted. On the other side of the coin, Osborne (2004) notes that the major development of game theory began in the 18th century with the mathematicians Emile Borel and John Von Neumann. The main event that shaped this field was in 1944 with the publication of the book *Theory of games and economic behavior* by von Neumann and Oskar Morgenstern.

In Samuelson (2016:107-130) the author highlights that despite the evolution of game theory, it was rather an isolated field in the 60's and 70's and did not find widespread applications in the field of economics. It was only adopted as a standard tool by the 1980's and 1990's. In the historical development of game theory, methodological individualism was a foundation for economists, this model assumes the stability of the individual behavior, however when game theory engaged in the alongside the theory of competitive markets in the subsequent decades, it provided a more general framework to understand the interactions between individuals. The author also delved into the development of game theory examining it through classical and instrumental and evolutionary views. Initially, game theory was predominantly shaped by the classical view that mainly focuses on describing the situation, which stood against the integration of game theory into economics. In response, the classical view gave away to an instrumental view, that emphasized the importance of studying interactions instead of literal description and focuses more on the usefulness in providing insights into the behavior of interest. Finally, the evolutionary game theory viewed games as based on experiences and learning processes. This approach aligns with economic thinking that emphasizes adaptive behavior and adjustment.

According to Martin (1978:85-110) game theory was first presented in 1943 as a mathematical solution to important economic problems, that back then had no suitable mathematical framework for monopolistic markets, so a strategy that maximizes profit that can at the same time take into consideration the actions of other players in the market was needed, and game theory was seen as a tool that can be helpful. The author of the article mentions that despite the fact game theory has many applications, it is particularly useful for this kind of problem.

In this context, the selective usefulness of game theory is highlighted. While it was applied to various fields such as law, biology and business ethics, the author noted that the primary areas of its application are war and economics because they align with the values reflected in game theory concepts. There are 3 ways in which game theory has proven useful;

- Providing practical advice in tactical decision-making situations like in the military context for example.
- Provided employment and amusement for individuals in many fields.
- Legitimizing military and political decisions.

So, game theory is not only a representation of decision making for academics, but also frequently used as a tool by individuals in real-world situations about policy creation and adoption. And from the historical background of the game theoretical analysis, its selective usefulness in war, politics and economics is made clear.

Oberholzer-Gee and Yao (2007) state that in the recent years, due to the increased interdependence that characterizes competitive and dynamic problems, it has become harder for managers to take strategic decisions because companies, game theory's analytical tools can come to a great use and allow decision makers to deal with interdependence and uncertainty. Since the more a success of strategy depends on the anticipations, relations of competitors, suppliers, or customers, the more valuable it becomes to use game theoretic analysis, managers can proceed by analyzing the strategic interaction, The author explained that it is done through many steps, the first step is problem formulation to fully understand what question(s) are currently arising. The second step is the model building where the strategists should determine the players, the availability, and the timing of the actions, what is the information available for each player... then the final step of the analysis is the decision making.

Additionally, Dixit and Nalebuff (2013:2-4) also states that the essence of game strategy is the interdependence of the players' decisions arising in 2 distinct ways;

- **Sequential:** In the case of alternative moves and hence, predict future actions.
- **Simultaneous:** When the actions of other players are unknown, but both players are aware that there are other active players, like in the case of prisoner dilemma.

Saloner (1991:119-136) discusses the positive attributes of game theoretical modelling and its potential contribution in strategic decision making. Back in the 1970's and 1980's, game theory was extensively used in industrial economics, and the focus was mainly on the external strategy, however, game theoretical tools have also proven useful in addressing internal organizational problems. The question that the article deals with is whether there is a more direct role for game theoretical modeling within strategic management. The author says that the question can be solved in two steps;

- Confirming that there is a role in strategic management for modeling the microeconomics variety.

It is true that whenever a model has the features of microeconomics, there is a tendency to consider it about economics, however, the impact of organizational structure on strategy falls within the field of strategic management even if they resemble microeconomics models. After confirming this first point, come the second step;

- Determining whether the model should be game theoretical or not.

Usually, the degree of rationality assumed in game theory is higher than other economics models, and mainly relies on the decisions of the rival. These assumptions are so noticeable in strategic management which gives room to a large range of behavioral assumptions. This was illustrated by the complexity of duopolistic markets compared to those characterized by a monopoly or perfect competition.

To answer the question, the author argues that the usefulness of game theory in strategic management depends on the role it is expected to play. If it is related to giving literal descriptions (*How much to produce or how to position a product for example*), because of the real-world complexities, the models will be limited and thus the rationality assumption in game theory can be critical, however, there are many games that occur under strategic management, where the degree of rationality does not pose problem.

Instead of relying on literal interpretations of game theory such as algorithms that generate managerial decisions based on given inputs, a metaphorical model can be employed. This type of model formalizes only selected features of interest to qualitatively simulate the environment under study. It helps to understand why certain outcomes occur while placing less burden on assumptions of full rationality.

Rumelt (2017:78) states that in business, challenges often arise from dealing with change and competition. To formulate an effective strategy, it is essential to understand the structure of the challenge, establish policies to address it, and design actions to implement those policies. According to Brickley et al. (2000:84-98), game theory provides a useful set of tools for managers to use when considering rivals in the decision-making process. Sound managerial decision-making often requires putting yourself behind your rival's desk, and assuming that this rival is knowledgeable and thoughtful, but the competitor's next steps are also based on what you will do, in exactly this kind of case when the competition between rivals is tense where game theory is most useful. Brandenburger and Nalebuff (1995:57-71), also support this point, by highlighting the importance of

focusing on others (*the other players in the market*), the authors argue that managers can profit from the insights of game theory to design optimal strategies, and benefit from what the other competitors bring to the market.

Additionally, Ross (2018:2859-2876) shows how game theory and particularly cooperative game theory play a pivotal role in the field of strategic management research, with the help of its capacity to clear up strategic interactions and its flexibility, it represents a strategic tool that provides managers with actionable insights to overcome competition and take informed decisions. In addition to game theoretic tools, Dixit, and Nalebuff (2013:2-4) mention three rules of strategy that must be followed;

- **Rule 1:** Look ahead and reason back: this rule basically means that the player should anticipate where its initial decision will lead and use this information to calculate its current best choices.
- **Rule 2:** If a dominant strategy is present, use it, however if the rival has a dominant strategy, it should be anticipated that they will follow it.
- **Rule 3:** Any dominated strategies should be eliminated to succeed.

To better understand these rules, it is important to clarify that a dominant strategy refers to a situation where, regardless of the actions of other players, one option remains the best for a given player. Conversely, a dominated strategy is one that always results in worse outcomes than another strategy, regardless of what opponents do. The process is about eliminating all the dominated strategies that may occur and keep choosing the dominant ones, to make the game less complicated.

Camerer (1991:137-152) argues that game theory was not widely used in the field of business strategy because of many criticisms. The first one is ignorance, the second one is that game theory generates customized models for local settings rather than general regularities, it only gives part of the advice the manager needs. And the third one is that game theory assumes more rationality than needed. However, the author argues that there is a solution for all the above given excuses. First, ignorance can easily be cured seeing all the resources available, and some game theory games require less rational calculations to find the equilibrium. Thus, all those criticisms are wrong: Game theory can provide valuable tools to strategy managers, especially if it does not neglect the dynamics of the market.

Dominici (2011:3524-3528) also highlights that the use of game theory is usually debated because of its rigid assumptions and its perceived detachment from reality. It is particularly challenging to incorporate game theory into fields like marketing, which are characterized by consumer behavior uncertainty and a constantly changing business environment. However, despite these criticisms, the article explores different uses for game theory in specific marketing contexts such as the pricing and product decisions and proposes methods for incorporating incomplete information and irrationality into models that reflect real-world scenarios.

Furthermore, McAfee and McMillan (1996:263-267) emphasize the value of game theory in crafting business strategies because it highlights a crucial element for strategic success: Competition. The authors explore how the product choice, communication and negotiation with stakeholders are influenced by competition and how game theory can be beneficial in that case, by emphasizing the reaction of the rival firms to different marketing strategies.

Moreover, Ozkan-Canbolat et al. (2016:685-693) suggest that in order for a company to stay ahead, redefining the business is important as well, which means reshaping the market and value propositions to gain competitive advantage, and using game theory can help with that by analyzing the competitive environments and helping with the understanding of strategic interactions.

In addition to that, Ginevičius and Krivka (2008:207-217) delve into the use of game theory models in duopolistic markets, the authors emphasize the applications of game theory models, such as prisoner dilemma and Matching pennies, in analyzing the performance of the key market players, and assessing the stability of agreement. These two elements have a significant impact on strategic management by influencing areas like decision-making, competitive advantage, market positioning and risk management. According to R14, game theory intersects with strategic management and provides companies with the necessary analytical tools to deal with competition effectively.

More recent research has extended the use of game theory beyond external competition, applying it to internal decision-making and management processes. Considering the interactive nature of the conflict process, Aydın and Karabacak (2023) used a game theory approach as an analysis and modeling tool in their study to jointly analyze the conflict management strategies of decision-makers and identify the most appropriate strategies. In

the analysis process, the conflict management strategies of the parties were first matched, and a new model, called the Mutual Dyadic Concern Model, was developed. Analysis of the model within the context of the Prisoner's Dilemma game supports the theoretical conclusions regarding the existence of a Nash equilibrium in which the parties adopt both competitive and cooperative strategies and the sustainability of the cooperative equilibrium. Analysis of the model within the context of the Chicken game supports the theoretical conclusions regarding the existence of an equilibrium in which at least one party does not adopt a competitive stance and that competition is unsustainable. Analysis of the model within the context of the Stag Hunt game supports the theoretical conclusions regarding the existence of an equilibrium in which both parties choose a cooperative strategy and that the cooperative stance is sustainable.

In addition to these contributions, recent studies have applied game theory to internal management and operational situations. Kesti (2024:899–914) presents an approach that merges Game Theory and Artificial Intelligence in an AI-assisted simulation game for management education. The report emphasizes that the simulation condenses years of experiential learning into a single session, giving leaders real-time feedback and strategic recommendations. This strategy promotes a comprehensive grasp of the relationship between employee well-being, team performance, and financial outcomes, improving managerial abilities and training leaders to make complicated decisions in dynamic circumstances. The authors suggest that AI-assisted simulation games may have a significant impact on the future of human capital management and leadership development.

Similarly, Renna (2024:1-12) examines new research that uses game theory models in production planning, scheduling, sustainable production systems, and cloud manufacturing. The paper underlines that combining game theory with additional methodologies, such as genetic algorithms, fuzzy logic, and Monte Carlo simulations, improves multi-objective solutions while lowering computational cost in real-time processes. The paper emphasizes the value of coalition and cooperative models for facilitating collaboration across multi-site resources and independent firms, as well as applications in renewable energy management. Renna concludes that game theory not only effectively addresses operational difficulties but also gives strategic insights for future research and practical applications in digitized and data-driven production systems.

3. METHODOLOGY OF THE RESEARCH

To further explore the usefulness of game-theoretic tools in strategic business decision-making, this study includes a simulation analysis. In addition to the insights from the literature review, this article examines the relation of game theory and marketing strategy by comparing the average payoffs of two cases, one where game theory's principles were used and another where they weren't.

The simulations involve two competitors, each of whom must decide on a marketing strategy to maximize market share. A duopolistic market structure is assumed, reflecting typical competitive circumstances in industries such as telecommunications, airlines, and consumer goods, where two major competitors frequently compete for market supremacy. The study employs two main marketing strategy types: aggressive and conservative, which represent frequent competitive orientations in commercial practice. An aggressive marketing strategy includes offensive competitive strategies such as significant spending, price reductions, intensive promotional efforts, and clear market share expansion goals. A conservative marketing strategy, on the other hand, indicates defensive positioning by maintaining expenditure levels, emphasizing profitability protection, and avoiding risky initiatives. This strategic contradiction illustrates the critical tension that managers face in chasing development possibilities while ensuring financial stability in competitive marketplaces. The prisoner's dilemma concept adequately depicts this strategic interdependence, since both competitors would profit from mutual collaboration through conservative measures, but face individual incentives to switch to aggressive strategies for potential short-term benefits.

The two marketing strategies to choose from are aggressive and conservative. The total market share will be assumed as 100%, so the payoffs of the simulation are between 0 and 100. The main variables were chosen as the marketing strategies (aggressive and conservative) and the resulting market shares. Several assumptions and settings were set up in this simulation to help structure the data. The market share range was established from 0 to 100 to represent the entire market. The two tactics were chosen to represent typical competitive extremes, and the number of iterations was set to 50 to provide a wide range of possible outcomes. Payoffs for each scenario were calculated in R Studio using the strategic interactions implied by the prisoner's dilemma paradigm.

Both simulations were run for 50 iterations to observe the dynamics over multiple scenarios. In the first case, the two competitors chose their marketing strategies independently. For the second case, game theory was involved,

and the payoffs were according to the principles of the prisoners' dilemma game. After getting the payoffs of every scenario, the average market share of all the iterations was calculated for both cases. Then a visualization of the average outcomes of the 50 iterations in both cases for the competitors is provided to clarify the difference between the results. R studio was used for this process.

4. FINDINGS OF THE RESEARCH

Taking into consideration the information mentioned in the methodology, two simulations were run on R studio, the first one represents a case where two competitors in a duopolistic market chose independently a conservative or aggressive marketing strategy, while in the second one represents a case where the two competitors used game theoretic tools in order to decide which marketing strategy will maximize their market share. we can have the average results of both players in the two cases.

4.1. Case Where No Game Theory Principle is Used to Determine the Strategy

In this case the two players chose their marketing strategies independently, without taking into consideration what strategy their competitor is following and without considering the use of any game theoretic tool. Table.1 shows the result of every player (market share), as well as their chosen marketing strategy.

Table 1. The Payoffs of Every Player without Using Game Theory

Player 1 Strategy	Player 2 Strategy	Player 1 Payoff	Player 2 Payoff
Conservative	Aggressive	3.071139008	10.3886592
Aggressive	Aggressive	26.55147349	16.53696874
Aggressive	Conservative	82.36266067	60.26038982
Conservative	Aggressive	70.7210043	91.93564644
Aggressive	Aggressive	51.73162941	67.90679449
Conservative	Aggressive	0.866401987	12.41675585
Aggressive	Aggressive	76.51339141	77.91505172
Conservative	Conservative	94.77281976	53.42976206
Aggressive	Conservative	15.58755517	46.51711942
Conservative	Conservative	55.55215331	57.82682218
Conservative	Aggressive	82.37175716	97.58159192
Aggressive	Aggressive	14.45135784	59.04518685
Conservative	Aggressive	44.07580034	69.83297833
Aggressive	Conservative	78.03055423	16.53374464
Conservative	Conservative	89.35006554	31.2056008
Conservative	Conservative	1.727855299	3.355150274
Conservative	Conservative	63.20507026	54.03890833
Conservative	Aggressive	26.04647537	9.511286486
Aggressive	Aggressive	97.71070494	12.8947251
Conservative	Aggressive	85.24369067	36.01239109
Conservative	Conservative	75.24672195	33.54536274
Aggressive	Conservative	23.29597112	5.754407821
Aggressive	Aggressive	33.34791155	63.62029293
Conservative	Aggressive	1.859536371	62.61796709
Aggressive	Aggressive	68.85210203	0.134537206
Conservative	Conservative	54.42326511	25.59815536
Aggressive	Conservative	69.22520956	71.31172272
Aggressive	Conservative	37.2587627	25.2154537
Aggressive	Aggressive	58.73832088	82.14731822
Conservative	Conservative	7.91063013	72.29151363
Aggressive	Conservative	44.3727108	40.28809192

Aggressive	Aggressive	60.60068933	8.099357504
Aggressive	Aggressive	1.386678172	49.055853
Conservative	Conservative	82.41071829	42.38903748
Aggressive	Aggressive	65.39919269	68.66307524
Aggressive	Aggressive	85.88309421	96.67145333
Conservative	Aggressive	17.97032896	91.1276896
Aggressive	Aggressive	52.17554078	47.87668006
Conservative	Conservative	9.381127357	7.259963872
Conservative	Conservative	95.95729958	6.178078894
Conservative	Conservative	55.88456097	58.2858704
Conservative	Aggressive	99.92415777	84.02927865
Conservative	Conservative	95.93497568	67.94383791
Aggressive	Aggressive	29.66955791	53.3838314
Aggressive	Aggressive	55.19819253	1.930582197
Conservative	Aggressive	32.13461898	17.6037774
Aggressive	Aggressive	53.93373508	57.24793086
Aggressive	Conservative	76.9350427	24.6702966
Aggressive	Conservative	80.7354456	59.28826276
Conservative	Aggressive	17.29006581	30.68202038

To compare the results easier, the next step is to calculate the Average payoffs (market share) for both players in this case;

- **Player 1:** 46.38145
- **Player 2:** 48.70960

So, when no game theoretic tools were used, the average market share of the first competitor was 46.38145%, and 48.70960% for the second competitor. In order to prove the usefulness of game theory in increasing the value of the market share for both competitors, in the following case, game theory will be used to determine the marketing strategy.

4.2. Case Where Game Theory Principles Are Used to Determine the Strategy

In case 2 both players chose their marketing strategies taking into consideration what strategy their competitor is following using the principles of the prisoner dilemma game. Table.2 shows the result of every player (market share), as well as their chosen marketing strategy.

Table 2. The Payoffs of Every Player While Using Game Theory

Player 1 Strategy	Player 2 Strategy	Player 1 Payoff	Player 2 Payoff
Conservative	Conservative	44.59298761	41.48502999
Conservative	Aggressive	75.08202095	60.03067261
Conservative	Conservative	59.0601393	13.86606568
Aggressive	Aggressive	2.910276875	50.18740541
Aggressive	Aggressive	80.51836102	78.80278418
Aggressive	Aggressive	45.66581808	12.76393048
Conservative	Aggressive	6.690915884	31.04593873
Conservative	Aggressive	96.34694883	61.33019957
Conservative	Conservative	51.80211752	67.07818534
Conservative	Conservative	71.02980611	50.58086563
Aggressive	Aggressive	66.59915205	34.58650303
Conservative	Aggressive	90.64044531	47.64018308
Aggressive	Conservative	82.56898397	63.28862326
Conservative	Conservative	19.85008975	21.52580156

Conservative	Aggressive	28.19013472	39.74017312
Conservative	Conservative	37.71050009	76.39574308
Aggressive	Conservative	94.08558218	54.57758477
Aggressive	Conservative	94.48161877	61.41403697
Conservative	Aggressive	47.50490666	0.61004092
Conservative	Aggressive	62.45842481	37.74255842
Conservative	Conservative	0.554159679	78.84840369
Aggressive	Conservative	44.27653227	10.81225276
Conservative	Aggressive	66.7013299	62.53563745
Aggressive	Aggressive	13.55069303	10.28610826
Conservative	Conservative	40.86868512	53.21901967
Conservative	Conservative	81.29722015	67.60387213
Aggressive	Aggressive	39.29686674	44.05865101
Conservative	Conservative	69.71725086	80.34729734
Aggressive	Aggressive	93.41619236	55.4606104
Conservative	Aggressive	33.38507276	26.29086466
Conservative	Conservative	84.69037649	30.31407055
Conservative	Aggressive	7.29178316	57.22202573
Conservative	Conservative	82.86036192	19.84229835
Aggressive	Aggressive	40.48870727	64.59865372
Conservative	Aggressive	14.51292436	57.14154388
Conservative	Conservative	13.59114149	30.24011634
Aggressive	Aggressive	12.8492	68.61168754
Conservative	Aggressive	42.13623691	12.83689195
Aggressive	Aggressive	36.88264077	72.9448512
Aggressive	Conservative	6.536505558	20.18650481
Aggressive	Conservative	55.64790613	12.33687992
Aggressive	Aggressive	12.96416852	57.03088008
Aggressive	Conservative	19.2649829	69.87520342
Conservative	Aggressive	75.58785644	81.99360981
Conservative	Aggressive	95.64279274	56.80998121
Conservative	Aggressive	68.38469305	25.57985249
Conservative	Conservative	58.69761787	70.73254129
Conservative	Conservative	78.10414378	37.24935011
Aggressive	Aggressive	95.00593578	59.40317453
Conservative	Conservative	13.17406502	16.78971096

The next step is to calculate the average outcome for both players in this case. Average payoffs for;

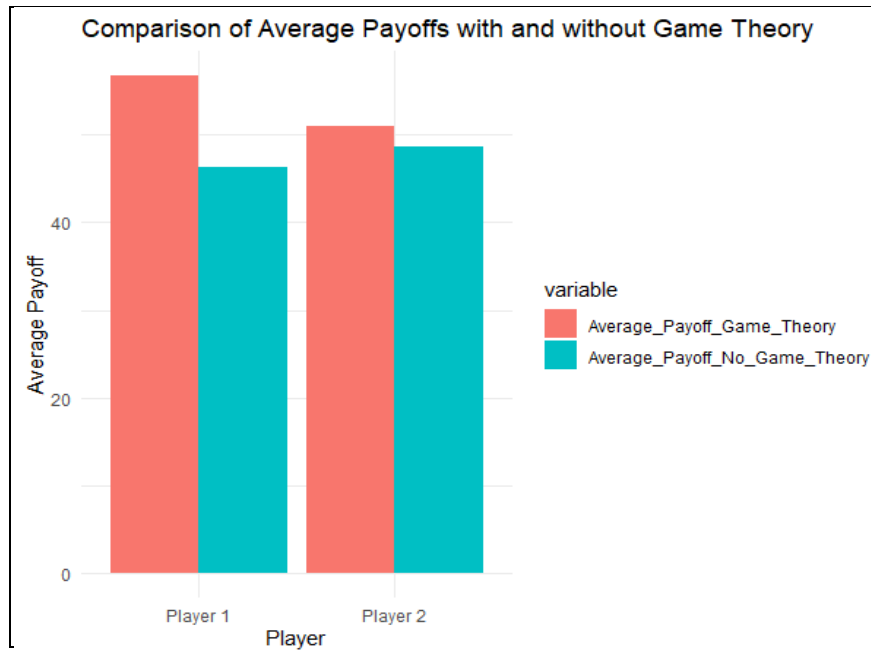
- **Player 1:** 56.72370
- **Player 2:** 50.93976

So, when game theoretic tools were used, the average market share of the first competitor was 56.72370%, and of 50.93976% for the second competitor. To better compare the obtained results, Table.3 shows the average market shares of the two competitors in the two cases.

Table 3. The Results of the Two Players

	Payoff with Game Theory	Payoff without Game Theory
Player 1	56.2370	46.38145
Player 2	50.93976	48.70960

To obtain a clearer idea about the difference between the results, R studio enables the visualization of the average payoffs.

Figure 1. The Visualization of the Average Payoffs of Both Players with and Without the Use of Game Theory

As noticed from the comparison of the two simulated scenarios, both competitor's average market share (payoff) increased considerably when they employed game theory concepts and took into account one another's potential chosen strategies. This change brings to light an important insight: performance results can be directly improved by anticipating the moves of competitors. This disparity is graphically supported by Figure 1, which demonstrates a definite increase in average payoffs when game-theoretic reasoning is used.

The incorporation of game theory into strategic marketing decisions enabled both parties to avoid persistently negative results and instead gravitate toward mutually beneficial solutions, even in a competitive environment. This highlights the importance of strategic interdependence, in which the outcome for each player is determined not just by their own actions but also by the choices of their competitors.

Gaining a durable competitive advantage in dynamic and competitive markets requires a way to anticipate, adjust, and strategically react to competitor actions. By providing a structured framework for simulating such behavior, game theory assists businesses in transitioning from reactive decision-making to more strategic and proactive approaches.

The article's hypothesis, that game-theoretic tools can enhance strategic decision-making by offering a framework for predicting rival responses is substantially supported by these findings. This implies that strategic managers can make better, data-driven decisions that optimize market share and long-term company performance by including such tools into their planning processes.

In practice, firms can use these insights to create more effective marketing efforts by anticipating competitor moves and tailoring their strategy accordingly. Companies in duopolistic or highly competitive markets, for example, could use scenario-based simulations to test price, promotion, and product launch decisions before implementing them. Furthermore, decision-makers can include game-theoretic analyses into strategic planning meetings to discover mutually advantageous outcomes, reduce the dangers of aggressive competitive disputes, and increase overall market performance.

5. CONCLUSION

All in all, the article has examined the connections between the two concepts of game theory and strategic management, by showing their evolution and mutual dependency over time. With its origins in the works of the mathematicians Borel and Von Neumann, game theory has developed into a useful tool for strategic decision-makers to overcome the dynamism and interdependency of the current business environment. Additionally, the

historical development of strategy was explored, illustrating its shift from military roots to its application in business, now known as strategic management.

A thorough examination of the relationship between game theory and strategic management from a variety of angles was provided in the literature review part. The study traced the development of these ideas from their historical roots to their emergence as key components of business management. The paper further explained the concrete advantages of using game theory in company planning through simulation-based analysis. The study showed that when decisions were made using game-theoretic principles, specifically those derived from the prisoner's dilemma framework, market outcomes were consistently more favorable. This was achieved by simulating a duopolistic market with two competitors adopting either aggressive or conservative marketing strategies. The simulations run in R Studio showed that both players had larger average market shares when they took into account their competitors' expected reactions and strategic foresight.

These findings highlight the importance of game theory in sectors where the behavior of rivals is highly interrelated. Businesses in industries such as retail, automotive, or telecommunications can improve their strategic results by implementing analytical tools that model competitive interaction and facilitate better informed, proactive decision-making. However, it is important to recognize that the simulations used in this study rely on simplified assumptions that might not fully represent the complexity of actual markets, such as symmetric information, rational conduct, and preset payout structures.

Future studies should look at multi-player interactions in more dynamic competitive situations, combine historical data, and incorporate more intricate behavioral aspects. This would provide a more thorough comprehension of how game-theoretic strategies change in real-world situations and how businesses might adjust their strategies accordingly.

In conclusion the study's results, taken together, provide compelling evidence that game theory can be a useful tool for strategic managers looking to maximize results in competitive environment. Incorporating analytical models such as game theory into decision-making frameworks will not only be advantageous but also necessary for sustaining a competitive advantage as the business world grows increasingly data-driven and interconnected. Researchers are advised to conduct future studies on this topic. Conducting new research based on game theory across all managerial activities, particularly marketing, R&D, inventory management, human resources management, financial management, and technology management, will enrich the literature.

YAZAR BEYANI / AUTHORS' DECLARATION:

Bu makale Araştırma ve Yayın Etiğine uygundur. Beyan edilecek herhangi bir çıkar çatışması yoktur. Araştırmanın ortaya konulmasında herhangi bir mali destek alınmamıştır. Makale yazım ve intihal/benzerlik açısından kontrol edilmiştir. Makale, “*en az iki dış hakem*” ve “*çift taraflı körleme*” yöntemi ile değerlendirilmiştir. Yazar, dergiye imzalı “*Telif Devir Formu*” belgesi göndermiştir. Mevcut çalışma için mevzuat gereği etik izni alınmaya ihtiyaç yoktur. Bu konuda yazar tarafından dergiye “*Etik İznine Gerek Olmadığına Dair Beyan Formu*” gönderilmiştir. Yazar, çalışmanın tüm bölümlerine ve aşamalarına tek başına katkıda bulunmuştur. / **This paper complies with Research and Publication Ethics, has no conflict of interest to declare, and has received no financial support. The article has been checked for spelling and plagiarism/similarity. The article was evaluated by "at least two external referees" and "double blinding" method. The author sent a signed "Copyright Transfer Form" to the journal. There is no need to obtain ethical permission for the current study as per the legislation. The "Declaration Form Regarding No Ethics Permission Required" was sent to the journal by the author on this subject. The author contributed to all sections and stages of the study alone.**

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