

Analyzing Social Media on Advertising Markets: A Game Theory Perspective

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Abstract

This research explores the application of game theory in analyzing the intricate relationships among advertisers, social media platforms, and users in the advertising markets. By examining the strategic aspects of game theory, the study sheds light on the strategies, equilibria, and outcomes that shape the landscape of social media advertising. This thesis investigates how advertisers strategically compete on social media platforms, considering factors such as targeting, bidding, and adaptation. It also explores the factors influencing user behavior and advertising policies, including user preferences, engagement levels, peer recommendations, platform algorithms, and privacy concerns. Through the analysis of equilibrium outcomes and market structures, it reveals the oligopoly market structure, targeting and personalization strategies, and the dynamics of advertisement auctions and pricing. Last but not least, this thesis provides suggestions for policymakers to take into consideration so that they can make the most advantageous decision appropriately.

Keywords

Game Theory, Nash Equilibrium, Social Media, Advertising

1. Introduction

1.1. Background

In the modern digital generation, social media platforms have completely changed how people interact, communicate, and absorb information. Platforms such as Facebook, Instagram, and Twitter have skyrocketed in popularity among people of all ages and have become significant roles in the advertising industry (Winfield, 2017; Cornell University, 2022). With the rapid growth of social media users and the extensive influence of these platforms, it's crucial for both marketers and consumers to understand the dynamics of the advertising market.

Game theory is a connection between mathematics and economics that pro-

vides a framework for analyzing strategic interactions (Brams & Davis, 2023; Indeed Editorial Team, 2023). Hence, this research aims to further explore the intricate relationships between advertisers, social media platforms, and consumers in advertising markets. By examining the game-theoretic aspects, this research shed light on the strategies, equilibria, and outcomes that shape the landscape of social media advertising.

1.2. Significance of the Study

First of all, this study helps understand the intricate interactions between advertisers and social media platforms, helping businesses and policymakers understand how these markets work. Furthermore, by analyzing social media advertising through game theory, this study provides insightful market dynamics and policy suggestions which can help advertisers and social media platforms to devise optimal strategies to reach their target audience effectively and optimally.

1.3. Limitation

While this thesis makes a few contributions to the understanding of advertising markets from a game theory perspective, it is essential to mention its limitation.

1) Data Availability: This research heavily relies on the availability of data related to social media and advertising. Data constraints may limit the scope of the analysis of the finding.

2) Complexity: The social media industry is complex and continuously evolving. Some dynamics of advertising market might not be fully included in this study.

1.4. Research Question

1) How do advertisers strategically compete on social media platforms considering the game theory?

2) What are the factors that influence user behavior and advertising policies in response to the strategic interactions among advertisers and users on social media?

3) What are the equilibrium outcomes and potential market structures that arise in the social media advertising market when analyzed through a game theory framework?

2. Related Literature Review

2.1. Game Theory

“Game theory provides a strategic lens to understand and navigate complex interactions, revealing the underlying dynamics of decision-making (Tadelis, 2013).”

“Game Theory: An Introduction” begins with a clear explanation of the basic concepts of game theory, including players, strategies, payoffs, and the Nash equilibrium (Tadelis, 2013). The book offers many real-world examples and applications to illustrate the relevance of game theory in various decision-making scenarios. The book covers a wide range of game types, which is beneficial in helping readers to understand the versatility of game theory. Also, the clarity

and coherence of Tadelis' writing style contribute to the overall effectiveness of the book.

Despite the numerous strengths of *Game Theory: An Introduction*, some limitation exists. First of all, while the book covers a wide range of games, it may lack deep analysis of certain topics. Furthermore, although the book includes practical examples, more diverse applications of different industries would have enhanced the book's real-world applicability.

The research gap in this book revolves around the lack of recent developments in game theory beyond the book's publication date. Readers might feel the need of updated information that explores the latest applications such as recent social media platforms which could be filled in this research.

2.2. Multiplayer Game

“Multiplayer games involve strategic interactions among multiple players, where each player's decisions impact not only their own outcomes but also the outcomes of all other players involved (Smith, 2019).”

The article examines the complexities of multiplayer games, focusing on strategic interactions among players and the dynamics that emerge during the game (Smith, 2019). It also outlines the importance of multiplayer games as a dominant form of entertainment and their significance in shaping contemporary gaming culture. The inclusion of case studies helped readers grasp the intricate dynamics between players in different multiplier contexts.

The article successfully conveys the importance of strategic interactions and player dynamics in multiplayer games. However, there exist limitations. The research mainly focuses on the general multiplayer gaming experience without delving into specific game genres that might influence player behavior differently. The research did not consider the diversity of players. Thus, since this thesis is mainly about a multiplayer game that implicates social media platforms, it considers a wide range of payers.

2.3. Advertising Markets

“Advertising markets can be seen as strategic arenas where firms strategically compete for consumers' attention and resources, employing game theory principles to optimize their advertising strategies and gain a competitive edge (Godes & Feldman, 2010).”

The article established the theoretical framework of game theory and its relevance to advertising decisions which highlights the importance of understanding the competitive situation of the advertising industry, where business must consider both their own actions and their competitors' responses (Godes & Feldman, 2010).

Despite the article's strengths, there are a few limitations to consider. Firstly, the paper mainly focuses on the theoretical models and did not provide sufficient real-world examples or case studies to examine the practical application of game theory in advertising. Secondly, the article is published in 2010 and may

limit the coverage of recent development and advancement in the field of both game theory and advertising. This thesis will thus, focus more on the interactions and outcomes of advertising markets on social media platforms from 2010 till now.

3. Research Methods

3.1. Research Design

Since this research mainly provides a deeper perception of the dynamics of games used in social media platforms and the factors that influence player decisions, it used a qualitative research method that went through several references and a document and also added the author’s own analysis. The study’s time frame encompasses data collection and analysis over a period of two months, from June 2023 to July 2023.

3.2. Data Collection

For this research, data collection will consist of two main components, literature review, and social media analysis. The literature review will be conducted using a systematic approach to search for relevant academic papers and news. A comprehensive research strategy will be employed including electronic databases such as Google Scholar and academic journals related to marketing, game theory, and social media. The selection of important papers will be based on predefined criteria, which include relevance to the research questions. Also, the paper is open to all age reviews.

This paper used the method of a systematic approach to select and track important papers. Also, it used the method of content analysis which focus on one document a several references in order to find the answer to the research objectives. To ensure all relevant papers are collected, key terms such as “game theory”, “strategic interaction”, “social media”, “advertising markets” and “consumer behavior” are used in different combinations to retrieve relevant literature and paper. Lastly, throughout this paper, it is all written in English.

3.3. Data

Author and year	Title	Related findings
Eric Anderson, 2010	Social Media Marketing: Game Theory and the Emergence of Collaboration	Game theory emerges as a powerful framework for understanding the dynamics of social media advertising (Anderson, 2010). Like players in the game, these characters must analyze the potential outcomes, anticipate their competitors’ moves, and make calculated decisions to gain a competitive advantage. The perception gained from game theory help s social media navigate the complex of social media marketing and ultimately drives success in the digital community (Anderson, 2010).

Data source: Social media marketing: game theory and the emergence of collaboration.

3.4. Assumption

- 1) Rationality: Game theory assumes that all players involved in social media

marketing are rational decision-makers. They tend to maximize their own profits and interests based on their understanding of the game's rules (Pettinger, 2021; Indeed Editorial Team, 2022).

2) Strategic Interactions: Game theory focuses on the strategic interactions between different players. It assumes that each player considers the decisions of others and responds to them strategically to maximize their outcomes (Brams & Davis, 2023).

3) Payoffs and Incentives: The theory presumes that each actor in social media marketing is driven by several payoffs and incentives. These payoffs can include increased sales, customer engagement, or a positive reputation. Actors make decisions based on their perceptions of the potential rewards and costs associated with each strategy they have used (Brams & Davis, 2023).

4) Strategic Behavior: Game theory assumes that actors in social media marketing engage in strategic behavior. Actors may employ various tactics such as competitive pricing, content differentiation and influencer collaboration (Picardo, 2022).

5) Incomplete Information: Game theory considers that participants in social media marketing often face incomplete information about their competitors, target audience, or market conditions (Chen, 2023).

6) Nash equilibrium: Players in game theory are supposed to achieve Nash equilibrium, which is a state where no actor can unilaterally deviate from their strategy to improve their own outcome (Chen, 2023).

4. Results and Discussion

4.1. Advertiser Strategic Interactions

Through researching game theory, this section reveals the strategies that advertisers had implemented which can maximize their outcomes.

Strategic interaction	Game theory concept
Targeting and Segmentation	Player strategies and the idea of partitioning a game into sub-games.
bidding and Pricing	Strategic moves taken by players and payoffs resulting from players' strategic decisions.
Monitoring and Adaption	Information gathering and strategic adjustment.

1) Targeting and Segmentation: Advertisers analyze user data and segment them based on demographics, interests, and behaviors. By identifying specific targets, advertisers can make their advertisements to be more suitable and appealing to the users, maximizing the effectiveness of advertising campaigns (Hamilton, 2023).

2) Bidding and Pricing: Advertisers participate in bidding systems offered by social media platforms to secure advertisement placements. Game theory guides

their decision-making by considering factors such as bid pricing and the expected value of reaching their target users (Godes & Feldman, 2010).

3) Monitoring and Adaptation: Firstly, game theory emphasizes the importance of adaptation and responsiveness. Thus, advertisers consider the optimal timing on social media platforms. They analyze user behavior, peak usage times, and the effectiveness of different advertisement placements. After reviewing the results, advertisers adjust their strategies which allows them to optimize their campaigns, exploit opportunities and stay ahead of their competitors (Winfield, 2017).

4.2. Factors Influencing User Behavior and Advertising Policies

Several factors influencing user behavior and advertising policies in response to the strategic interactions between advertisers and users on social media platforms are examined below.

1) User Preferences and Interests: Users have their own preferences and interests on social media platforms. Advertisers must consider these preferences and align their advertisements with users' interests to capture their attention (Winfield, 2017).

2) Engagement Levels: User engagement plays a significant role in determining the effectiveness of advertising. Factors like likes, comments, shares, and click-through rates examine the level of user interest and interaction with advertisements (Chen, 2023).

3) Peer Recommendations: Users on social media platforms are usually influenced by their peers. Positive reviews, endorsements, or shares from friends and influencers can significantly impact user behavior and purchasing decisions.

4) Platform Algorithms: Social media platforms employ algorithms to prioritize the content users see on their feeds. These algorithms take into account factors such as user preference and past behavior (Brams & Davis, 2023).

5) Privacy Concerns and Transparency: User behavior and attitudes are influenced by concerns related to ad transparency and privacy. Users usually are more likely to engage with advertisements that are transparent about their purpose, source, and data usage (Chen, 2023).

4.3. Equilibrium Outcome and Market Structures

In this section, the results of analyzing the social media advertising market through a game theory framework are examined below.

1) Oligopoly Market Structure: The social media advertising market often exhibits oligopoly, where a few dominant advertisers on platforms hold significant market share. Advertisers strategically compete to establish their dominance and gain a competitive advantage. This often results in a concentrated market structure with a limited number of influential players (Winfield, 2017).

2) Targeting and Personalization: Equilibrium outcomes involve advertisers increasingly focusing on targeting and personalization. Advertisers aim to reach

specific segments of users with content that meet their interests and preference. This can lead to more precise targeting and improved user experiences as advertisements become more relevant to users (Chen, 2023).

3) Ad Auctions and Pricing Dynamics: In equilibrium, the auction dynamics determine the pricing of ads. Advertisers strategically bid to secure optimal ad placements at competitive prices. The equilibrium outcomes can involve fluctuating bid prices (Godes & Feldman, 2010).

5. Conclusion and Suggestion

5.1. Conclusion

By answering the three research objectives, this thesis shed light on the complicated dynamics of strategic interactions among advertisers and users. Firstly, advertisers strategically compete through targeting and segmentation, bidding and pricing, and monitoring and adaptation. Secondly, user preference and interests, engagement levels, peer recommendation, platform algorithms and privacy concerns, and transparency are the factors that influence user behavior and advertising policies. Thirdly, oligopoly market structure, targeting, personalization, ad-auctions and pricing dynamics are the equilibrium outcomes and potential market structure that arise in the social media advertising market through analyzing a game theory framework. Last but not least, the most important thing I learned during the process of this research is that the person that can eventually win in the market must have the ability to predict the balance, break it, and constitute a self-advantageous equilibrium.

As for policy recommendations, from the position of a social media platform operator, they should maximize its usability to encourage advertisers to buy more keywords in order to achieve the most profitable results, and this is the first balance that benefits social media platforms the most from a game theory perspective. On the other hand, policymakers of an advertisement buyer should evaluate the most frequently searched keywords customers would use when searching for specific products and utilize the method of precision marketing that makes the most effective use but spends the least amount of money. Moreover, they should effectively utilize SEO, which is an algorithm that ensures your company's website appears first when people search for similar products. With this strategy, the advertisement buyer can achieve the best results without spending too much money, while this is the second balance that benefits the buyer the most.

5.2. Suggestion

Regarding recommendations for future students or even scholars who want to further explore this certain topic, a thorough research about a specific game theory model is highly suggested. Moreover, conducting several empirical studies to validate and refine the theoretical findings of the game theory analysis is strongly recommended.

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Conflicts of Interest

The author declares no conflicts of interest regarding the publication of this paper.

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