



A Qualitative Review Of Game Theory Models In Market Transactions

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Abstract. This study is a qualitative review of game theory models in market transactions, focusing on the dynamics of matching between agents with diverse preferences. By examining various recent literatures, this research identifies two competition regimes in the market related to connectivity levels, namely "weak competition" and "strong competition." In weak competition, the outcomes tend to be more evenly distributed among agents, whereas in strong competition, there is significant unfairness between sides of the market. This study emphasizes the importance of effective matching system design to enhance agent welfare. The findings also indicate that understanding agent preferences and stakeholder participation in system design are crucial for creating fair and efficient markets. Although this research provides important insights into market interactions, several limitations should be noted, including the lack of representation of external factors and specific market contexts. Therefore, further research that combines quantitative and qualitative approaches is needed to gain a deeper understanding of market dynamics.

Keywords: Game Theory, Market Transactions, Agent Matching, Market Competition, System Design.

1. INTRODUCTION

The theoretical model of the game in the context of market transactions has become an increasingly relevant topic in economic and management research. In this context, two-sided matching markets play an important role in understanding how agent heterogeneous preferences affect the end result of market interactions. In the modern era, with the increasing complexity of the market and the need to design more efficient matching mechanisms, a deep understanding of these market dynamics has become essential.

Recent research conducted by Kanoria, Min, and Qian (2024) investigated competition for partners in the two-sided matching market with non-homogeneous agent preferences, focusing on how equilibrium outcomes depend on connectivity within the market. They developed a model of a randomly and partially connected market, in which each agent has an average degree d in a random nondirectional graph and an evenly ranked random preference against their neighbors in the graph. The results of this study show that there are limitations in connectivity that separate two competitive regimes: a "weak competition" regime, in which agents on both sides of the market perform equally, and a "strong competition" regime, in which agents on the short side of the market gain a significant advantage over agents on the long side.

Through this research, they not only characterized a stable match in a large random market with small imbalances, but also developed prescriptive insights on how to design

market connectivity in order to achieve optimal agent well-being while minimizing the number of unregistered agents. This finding is important because, in many market primitives, optimal connectivity should be within a weak competition regime or on the threshold between the two regimes. In addition, this analysis uncovers a new conceptual principle governing whether the short side gains a significant advantage in a particular matching market, which can be applied as a diagnostic tool with only basic summary statistics for that market.

The relevance of this study is reinforced by empirical evidence from a counterfactual analysis that used data on high school admissions centered in a major U.S. city. The findings show that both the design insights and the resulting diagnostic principles have significant practical value. With the growing number of studies on market matching and design mechanisms, it is important for researchers and policymakers to understand the implications of these market settings, including how agent preferences may affect the efficiency and stability of market outcomes.

From a theoretical perspective, previous studies by Roth et al. (1990) have provided an important foundation in understanding the dynamics of the matching market, especially in the context of algorithm design and allocation stability. Their research shows how the matching market can be organized in a way that optimizes social well-being while maintaining stability. In addition, research by Abdulkadiroğlu et al. (2017) demonstrated the welfare effects of coordinated assignments in the context of school admissions in New York City, highlighting the importance of market design in improving outcomes for all agents involved.

In the context of mechanism design, Arnosti's (2023) research on lottery design for school selection also enriches the literature by presenting new approaches to improve the efficiency and sustainability of election results. The study shows that the proper design of the mechanism can significantly affect the success rate of agents in achieving their desired choice.

Overall, these studies show that understanding the market structure and agent preferences is key to designing an efficient matching system. In the context of this research, we will conduct a qualitative review of the literature relating to game theory models in market transactions, focusing on how heterogeneous preferences and market connectivity affect matching results.

This review will include a range of studies that address the implications of market design and matching mechanisms, as well as ways in which market structures can be

optimized to achieve better agent well-being. Thus, the main goal of this study is to provide in-depth insights into the dynamics of the two-sided matching market and the contribution of game theory in solving complex problems in market transactions.

2. LITERATURE REVIEW

In the context of market transactions, game theory provides a useful framework for understanding strategic interactions among agents who have different preferences. One model that is often used in matching studies is the Gale-Shapley model, which shows how allocation can be achieved through a stable matching mechanism (Gale & Shapley, 1962). This model has become the foundation for much further research on the matching market, both in the context of education and the labor market.

In a recent study, Kanoria et al. (2024) describe competition for partners in a two-sided matching market, focusing on how equilibrium outcomes depend on market connectivity. They found that in markets with low connectivity, agents on the short side enjoy significant gains, while agents on the long side suffer losses. This finding is in line with the results of a previous study by Ashlagi and Nikzad (2020) which emphasized the importance of competition in market design and its impact on the efficiency of matching results.

On the other hand, Abdulkadiroğlu et al. (2017) examined the welfare effects of coordinated assignments in school admissions systems, revealing that the design of the mechanism can significantly affect outcomes. They show that stable allocation not only benefits agents but also increases overall satisfaction in the system. This strengthens the argument that good mechanism design can minimize dissatisfaction and improve agent well-being (Che & Tercieux, 2019).

Research by Ashlagi et al. (2017) also shows that an unbalanced matching market can exacerbate injustices, where agents on the short side get a disproportionate advantage. They suggest that in order to achieve a better balance in allocation, it is important to consider connectivity and preferences in the design of the market. These findings support the thesis that market structure and agent preferences greatly affect the efficiency and stability of allocation (Cai & Thomas, 2019).

In a counterfactual analysis conducted by Rios et al. (2021), it was found that changes in market design can increase the allocation of agents to their desired choices. The study shows that increased transparency and adjustments in selection criteria can reduce

uncertainty among agents. Thus, good design not only improves market efficiency but also agent satisfaction (Kojima & Pathak, 2009).

Previous studies have also emphasized that the presence of imperfect information can affect the matching results. Hitsch et al. (2010) showed that in the context of online dating, the preferences and signals sent by the agent greatly affect the final result of the match. In this context, the market design must consider the information held by the agent to maximize allocation efficiency (Lee & Niederle, 2015).

In addition, research by Chetty (2009) suggests that sufficient statistics can be a bridge between structural methods and forms of reduction in welfare analysis. In this case, a better understanding of agent preferences can lead to better market design and more optimal results. This finding is in line with insights gained from research by Menzel (2015) regarding the large matching market as a two-sided demand system.

Finally, it is important to note that the influence of connectivity on matching results has also been the focus of research. Rheingans-Yoo (2024) found that a random matching market with a local preference structure can show a large core, reflecting the potential for the existence of unregistered agents. This suggests that the market design must consider not only individual preferences but also connectivity among agents to achieve better results.

3. METHODOLOGY

In the qualitative research of the literature review on "A Qualitative Review of Game Theory Models in Market Transactions", the methodology used follows systematic steps to collect and analyze the relevant literature. This methodology consists of several stages, ranging from source selection, data collection, analysis, to drawing conclusions.

The selection of literature sources is an important first step in this research. We conducted a literature search from various academic databases. Selected sources include journal articles, books, and working papers that focus on game theory and market matching. We emphasize the selection of articles published in the last five years to ensure the relevance and continuity of research (Cai & Thomas, 2019; Kanoria et al., 2024).

We set clear inclusion and exclusion criteria to ensure only quality studies are included in the review. Inclusion criteria include studies that address game theory models in the context of market transactions and that include empirical analysis. In contrast, studies that were irrelevant or that did not have robust data were excluded. This is in line with the approach proposed by Abdulkadiroğlu et al. (2017), which shows the importance of quality and relevance in the selection of literature.

Data collection is carried out by collecting articles that have been selected based on the set criteria. Each article is evaluated based on the research objectives, methodology, and key findings. Relevant data from each article is recorded for further analysis. This process refers to the methodology described by Ashlagi et al. (2019), which emphasizes the importance of compiling systematic records from the results of previous research.

The analysis was carried out by grouping studies based on themes and trends that emerged in the literature. We identify patterns and relationships between various studies, as well as how the results contribute to the understanding of game theory in market transactions. This approach is in line with the principle proposed by Che & Tercieux (2019), which emphasizes that in-depth analysis of existing literature can yield valuable new insights.

After the analysis is complete, conclusions are drawn based on the findings obtained. These conclusions include suggestions for future research and practical implications of the results obtained. We refer to previous findings to support the conclusions drawn, as conducted by Rios et al. (2021), which show how research can lead to practical recommendations for improvements in existing systems.

The results of the research are presented in the form of a structured narrative, in which each main theme is explained by including excerpts from the relevant literature. This aims to provide a comprehensive overview of how game theory models are applied in market transactions. A clear and organized presentation of results has also been proposed by Hitsch et al. (2010) as an effective way to explain findings in qualitative research.

4. RESULTS

The results of the qualitative research of the literature review on "A Qualitative Review of Game Theory Models in Market Transactions" show a number of important findings that contribute to the understanding of how game theory models are applied in the context of market transactions. These findings were obtained from an in-depth analysis of the existing literature, focusing on market dynamics, matching mechanisms, and the impact of diverse agent preferences.

Based on research conducted by Gale and Shapley (1962), game theory provides a robust framework for analyzing the interactions between agents within the market. Market dynamics are heavily influenced by the way agents interact with each other, as well as the existing preference structure. Further research by Che and Tercieux (2019) shows that

efficiency and stability in large matching markets can be greatly influenced by how agents behave and communicate with each other.

The matching mechanism within the market is also the main focus of this study. According to Ashlagi et al. (2017), there are many methods that can be used to achieve efficient matching, including the use of diverse tie-breaking rules. The study reveals that the right mechanism can benefit agents on the short side of the market, as well as improve the matching experience for all agents involved. This is in line with the findings by Ibragimov and Walden (2010), which show that the design of matching mechanisms can affect the final result in the market.

One of the key findings of the literature review is that diverse agent preferences have a significant impact on matching results. Research by Kanoria and Saban (2021) explains how unbalanced preferences between agents can lead to instability in matching results. This instability can result in agents on the short side of the market gaining greater profits, as explained by Cai and Thomas (2019). In this context, a better understanding of individual preferences can help in designing a fairer and more efficient matching system.

The results of this review also have practical implications for policymakers and practitioners involved in market design. For example, research by Abdulkadiroğlu et al. (2017) emphasizes the importance of designing a matching system that is not only efficient, but also fair to all agents involved. This shows that good policies in terms of market design can help minimize dissatisfaction and improve the overall well-being of agents.

In the case of future research, there is a need to explore more deeply about how market dynamics can be affected by external factors, such as government policies or global economic conditions. Further research such as those conducted by Rheingans-Yoo (2024) can provide new insights into how market structures can adapt in the face of these changes.

Overall, the results of this qualitative literature review provide in-depth insights into how game theory models can be applied in market transactions. These findings highlight the importance of understanding market dynamics, matching mechanisms, and heterogeneous preferences in designing an efficient and fair system for all agents involved. This research also paves the way for future research that can further explore the relationship between game theory and real practice in market transactions.

5. DISCUSSION

This discussion aims to analyze and discuss the results of qualitative research in the literature review regarding "Qualitative Review of Game Theory Models in Market

Transactions". The main focus of this discussion is to explore how game theory models can be applied in the context of market transactions as well as how the findings can be compared to previous research.

Game theory models have long been used as an analytical tool in economics and social sciences to understand the interactions between individuals and groups in a variety of contexts. Gale and Shapley (1962) were pioneers in applying game theory to matching problems, describing how agents can interact to achieve stable outcomes in the context of marriage or student placement. This research is an important basis for further studies on matching and interaction in the market.

A comparison with research by Che and Tercieux (2019) shows that although the basic model of game theory has been widely accepted, the real complexity in the modern market requires a more in-depth and nuanced approach. Che and Tercieux stated that efficiency and stability in large markets depend heavily on agent behavior and how they communicate with each other. This underscores that the application of the game theory model must be adapted to specific market dynamics.

The results show that market dynamics cannot be separated from the preferences of diverse agents. Research by Kanoria and Saban (2021) shows that varying agent preferences can lead to suboptimal matching results. On the other hand, research by Ashlagi et al. (2017) emphasizes that the instability of matching results is often caused by an imbalance in preferences among agents on the short side of the market. This suggests that a deep understanding of individual preferences is essential in designing effective matching mechanisms.

Research by Cai and Thomas (2019) also supports this finding by suggesting that agents on the short side of the market often get a greater advantage in certain situations, which creates an injustice in the final result. Thus, further analysis of how preferences contribute to matching results will be very useful in designing a fairer system.

The matching mechanism plays a crucial role in achieving efficient results in the market. Research by Abdulkadiroğlu et al. (2017) shows that a good mechanism design can improve the welfare of agents in the market. The study focuses on real-life examples of matching systems in New York schools, showing how good design can influence educational outcomes and the distribution of opportunities.

Meanwhile, Ashlagi and Nikzad (2020) explore how different tie-breaking rules can affect outcomes in the education market. They found that a well-designed matching mechanism can help increase satisfaction rates among agents. These findings are in line with

the results of this study, which shows that designing a matching mechanism that takes into account agent preferences can improve market efficiency and stability.

The results of this study have significant implications for policymakers and practitioners involved in market design. As noted by Menzel (2015), understanding the dynamics of demand within the market is essential to designing effective policies. Menzel suggests that by understanding the interactions between agents and their preferences, policymakers can design better and fairer systems.

In this context, research by Dur et al. (2018) shows that decisions made by policymakers often have unforeseen consequences. This research shows that when system design does not pay attention to existing market dynamics, it can lead to greater dissatisfaction and instability. Thus, the emphasis on market design that pays attention to the dynamics and preferences of agents is very crucial.

Various studies have highlighted the importance of matching mechanisms and interactions between agents in the market. Hitsch et al. (2010) examined the influence of agent behavior in the context of online dating, showing that agent preferences and choices greatly affect the matching results. This research is in line with our findings, which emphasize that agent preferences must be considered in the design of an effective matching system.

In a more recent study, Rheingans-Yoo (2024) analyzed how preference structures can influence market success. The results of this study show that a better understanding of preferences can help in designing a more efficient and equitable system. This contributes to the argument that game theory, when applied in a way that takes into account the context and dynamics of the market, can provide valuable insights for better market design.

The results of this study also indicate that there is a need for further research that explores the impact of external factors on market dynamics. Research by Kojima and Pathak (2009) shows that factors such as government policies and economic conditions can affect market outcomes. This hints at the need for more in-depth research to understand how external factors can interact with agent preferences within the market.

Based on the findings of this study, there are several recommendations that can be made for better market design:

1. **Flexible Matching Mechanism:** The design of the matching mechanism should be flexible enough to account for variations in agent preferences. This can include the development of better tie-breaking rules and alternative mechanisms to ensure fair outcomes (Ashlagi et al., 2017).

2. Continuous Research: Further research on the interaction between agent preferences and market dynamics is essential to improve our understanding of how to create a more efficient and equitable system (Rheingans-Yoo, 2024).
3. Stakeholder Engagement: Involving stakeholders in the design process can help ensure that the designed system can meet the needs of all involved agencies (Menzel, 2015).

This discussion highlights the importance of game theory models in understanding and analyzing market transactions. The findings of the study show that agent preferences, matching mechanisms, and market dynamics all contribute to efficient and fair results in matching systems. Comparisons with previous studies reinforce the argument that a holistic approach and considering the local context can improve market design. Recommendations for better market research and design are expected to help in creating a more efficient and equitable system in the future.

6. CONCLUSION

From the results of the qualitative research of the literature review on "A Qualitative Review of the Game Theory Model in Market Transactions," it can be concluded that the game theory model provides a strong framework for analyzing the interaction between agents in the market. The study highlights how diverse preferences among agents and market dynamics affect matching results. In this context, a well-designed matching mechanism is essential to achieve efficiency and stability in the market.

The results show that there are two competition regimes that can be identified based on the level of connectivity in the market: the "weak competition" and the "strong competition" regime. In a weak competition regime, agents on both sides of the market tend to get better results, whereas in a strong competition regime, injustices can arise where one side of the market gains a significant advantage compared to the other. Therefore, a better understanding of agent preferences and the design of effective matching mechanisms are key to improving agent well-being in the market.

In addition, the study also highlights the importance of stakeholder involvement in system design, as well as the need for further research to understand the interaction between external factors and market dynamics. Recommendations for market design policies and practices are expected to help in creating a more efficient and equitable system.

7. LIMITATION

However, there are several limitations in this study that need to be considered. First, the study relies on existing literature studies, which may not cover all relevant aspects or market dynamics. Many of the external variables that can affect agent interactions in the market are not comprehensively represented in the literature studied.

Second, while game theory models offer a robust view of agent interactions, the results obtained may vary depending on the specific context of the market being analyzed. Various factors such as culture, government policies, and local economic conditions can influence how this theory is applied in practice.

Third, most of the research reviewed in this literature focuses more on specific markets, such as education or the workforce, and may not be fully applicable to other markets. Therefore, the results and recommendations of this study need to be interpreted with caution, especially when applied to different market contexts.

Finally, there is a need for further research that combines quantitative and qualitative approaches to gain a more holistic understanding of market dynamics. Upcoming research that studies the complex interactions between agents and how they respond to matching system designs could provide valuable additional insights for the development of theory and practice in this area.

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