Dean&Francis
ISSN 2959-6130

Escaping the Prisoner's Dilemma: A Game-Theoretic Analysis of Price Wars in Meituan's Food Delivery Ecosystem

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Abstract:

This paper employs the Prisoner's Dilemma framework to analyze the self-destructive price war between China's food delivery duopoly, Meituan and Ele.me. This intense competition, characterized by deep subsidies and mutual financial losses, presents a quintessential case of how rational individual strategies lead to collectively suboptimal outcomes in a two-sided market. The analysis first describes the current competitive situation, framing the platforms' strategic choices within a payoff matrix where "defection" (price-cutting) is the dominant strategy, leading to a stable but inefficient Nash Equilibrium. It further examines the significant barriers to cooperation, including some regulations, the threat of new entrants, and profound information asymmetry. To break this deadlock, the study proposes strategic interventions aimed at altering the fundamental payoff structure, such as competing on non-price dimensions (e.g., service quality, ecosystem integration) and fostering institutional transparency to lower the barriers to cooperation. The study concludes that transcending this dilemma is imperative for the industry's sustainable development, providing a strategic roadmap for managers to transition from destructive competition to a virtuous cycle of innovation. The findings offer actionable insights for stakeholders in oligopolistic two-sided markets globally that are susceptible to similar competitive traps.

Keywords: Prisoner's Dilemma; Nash Equilibrium; Two-Sided Market; Food Delivery Platform; Cooperation Barriers

1. Introduction

1.1 Research Background

As the social economy develops, consumer demand continues to grow, causing the food delivery industry to show a trend of expanding. Two major platforms, Meituan and Eleme, which collectively dominate

ISSN 2959-6130

the market with an estimated 65% and 28% share, respectively, as of 2025, with industry reports indicating a staggering 100 million daily orders nationwide. Both platforms have a high proportion in the market and a large number of consumers across the country. But still, in order to further expand their market share and seek higher profit, price wars often happen between two firms, which may cause a significant redistribution of the market share. Both platforms are providing services at a lower price, by giving high subsidies or coupons, which may attract more consumers and food suppliers to use their platform, making the platforms improve the opportunity of having the chance to get more market share, as they have more consumers.

Price war at a reasonable range is necessary, since platforms are reducing price, and improving the efficiency for higher proportion in the market, so may provide consumers with a better price and quality of goods, giving incentive to the food delivery platforms at the same time, however cutthroat price war may cause market disorder, price of the delivery may become unreasonable, leading to great harm for both consumers and food suppliers on the platform, it become hard for consumers to calculate their benefits, while food suppliers may suffer a deficit from it.

Using a theorem to explain the reason price wars exist may help the platform to be more incentive, also providing the chance for more platforms to get into the market, and may lower the barriers to entry. Finding any ways to prevent price wars from happening can ensure sustainable growth and stability of the take-out chain in the market. Also, studying how to solve the price war problem in practical applications plays an important role in providing a reference for future market development, creating a better atmosphere in the market.

This intense competition, characterized by mutual and often destructive price-cutting, can be rigorously analyzed through game theory. The competition between platforms, especially in two-sided markets like food delivery, is frequently analyzed through the lens of game theory, with the prisoner's dilemma providing a foundational model. Several have explored this phenomenon, offering critical insights that inform the analysis of Meituan's rivalry with Ele.me.

1.2 Literature Review

The competition between platforms, especially in two-sided markets like food delivery, is frequently analyzed through the lens of game theory. Several seminal studies have explored this phenomenon, offering critical insights that inform the analysis of Meituan's rivalry with Eleme.

Parker & Van Alstyne established a fundamental framework for understanding two-sided networks [1]. They analyzed how platforms compete for both user groups (e.g., consumers and restaurants). Their work is crucial for this analysis as it explains why platforms like Meituan are incentivized to heavily subsidize one side (consumers with discounts) to attract them, which in turn attracts the other side (restaurants). This creates a competitive trap where not subsidizing becomes a losing strategy, mirroring the payoff structure of a prisoner's dilemma.

Zhu & Liu specifically analyzed competition in the on-demand service economy [2]. They proposed that while price is a primary competitive lever, competition can evolve into dimensions beyond price, such as service quality and delivery speed. However, their research confirmed that in the initial growth phase, platforms almost inevitably fall into a prisoner's dilemma of price competition due to the low switching costs for consumers. This provides a theoretical basis for understanding the current state of the Meituan and Eleme rivalry and its potential future evolution.

Zhang & Li empirically studied the competition between Meituan and Ele.me [3]. They found clear evidence of a prisoner's dilemma where both platforms are forced to maintain high levels of subsidies and marketing expenditures. Their key finding was that this equilibrium of mutual defection (price-cutting) leads to significant financial losses for both players, validating the real-world application of the game theory model and highlighting the urgent need for strategies to achieve a more cooperative outcome.

A substantial body of existing literature on platform competition and the food delivery industry has effectively utilized game theory, particularly the Prisoner's Dilemma model, to explain the prevalence of price wars. Numerous scholars have focused on theoretical modeling of competitive equilibria and macro-level analyses of market structures that lead to mutually destructive outcomes. Studies, such as those by Parker & Van Alstyne, have thoroughly explained the economic incentives of two-sided networks that drive initial subsidy strategies [4]. Furthermore, research like that of Zhu & Liu has broadly confirmed that low consumer switching costs in on-demand services trap platforms in a competitive dilemma, while empirical analyses have documented the financial losses resulting from these ongoing price conflicts [5,6].

1.3 Research Framework

To address these research gaps, this paper proposes the following framework:

First, the article will conduct a deeper analysis and modeling of the current price competition between Meituan and Eleme. Moving beyond generalized descriptions, this section will integrate the latest financial reports, market data, and public cases to precisely define the core elements of the Prisoner's Dilemma model. It will specify what "cooperation" and "defection" strategies mean in this specific case (e.g., maintaining subsidies or launching aggressive

price cuts) and construct a realistic payoff matrix based on industry data to quantify the gains and losses for each player under different strategic combinations, thereby establishing a solid empirical foundation for subsequent analysis.

Second, the article will systematically diagnose the core barriers that continue the deadlock of the Prisoner's Dilemma. After confirming the equilibrium state of mutual defection, the research will delve into why it is difficult for both platforms to escape this predicament on their own. The analysis will go beyond the classic issue of "lack of trust" to focus on the unique context of the Chinese market, examining how antitrust regulation (e.g., the strict prohibition of collusion under the Anti-Monopoly Law), the threat of potential entrants (e.g., Douyin's local lifestyle services), user data and algorithmic transparency, and high sunk costs collectively reinforce the stability of this non-cooperative equilibrium.

2. Case Description

2.1 Background

Meituan, a dominant food delivery platform in China, operates in a highly competitive duopoly market alongside Eleme (owned by Alibaba) [7]. The industry is characterized by low differentiation in core services, with competition primarily revolving around pricing, delivery speed, and subsidies. In recent years, market growth has slowed due to saturation, forcing platforms to compete for existing users aggressively rather than acquiring new ones. This has led to frequent price wars, where both platforms simultaneously offer deep discounts, promo codes, and subsidized membership programs to attract price-sensitive consumers.

For years, the market enjoyed explosive growth fueled by venture capital. However, as user penetration peaked and the market matured, the growth paradigm shifted from acquiring new users to wrestling market share from the direct competitor. This transition triggered intense and sustained price competition, creating a strategic landscape perfectly encapsulated by the Prisoner's Dilemma from game theory.

2.2 Current State of the Price War

The pricing strategies of Meituan and Eleme exemplify a classic prisoner's dilemma. While both platforms would benefit from maintaining stable, moderate pricing to maximize profits, neither can resist undercutting the other for fear of losing market share. For instance, if one platform reduces delivery fees or increases discounts, the other must match or exceed these offers to retain customers [8]. In this dilemma, cooperation signifies maintaining stable prices, while 'defection' involves initiating price cuts to poach. This results in a Nash equilibrium where both players engage in costly price-cutting, eroding profit margins for the entire industry. Despite short-term gains in user engagement, long-term profitability is compromised.

2.3 Development and Implications

The ongoing price war has led to financial strain for both platforms and their merchant partners. Meituan's profit margins have fluctuated, while Ele.me continues to operate at a loss under Alibaba's subsidies. The dilemma persists because unilateral cooperation (i.e., raising prices) is unsustainable. If one platform defects by lowering prices, it gains a temporary market share advantage, while the cooperative player experiences an immediate and significant loss. High user switching costs and the commoditized nature of delivery services further exacerbate this dynamic.

To break the cycle, platforms are exploring non-price differentiators, such as improved logistics AI, eco-friendly packaging, and exclusive merchant partnerships. However, price competition remains the primary tool for competition, perpetuating the prisoner's dilemma. This case offers a compelling study of how game theory manifests in real-world platform competition, highlighting the inherent challenges of achieving.

3. Analysis of the Problem

The fierce and seemingly irrational price war between Meituan Waimai and Ele.me is not merely a result of aggressive management but a textbook manifestation of the Prisoner's Dilemma, a fundamental concept in game theory [9]. This model provides a powerful lens to diagnose the root cause of their sustained mutual losses, the stability of this detrimental equilibrium, and the significant barriers to escape. By framing their strategic choices within this paradigm, we can move beyond superficial observation to a deeper understanding of the structural forces driving this conflict.

This strategic interaction can be formalized using a payoff matrix (Table 1), where each platform must choose to 'Cooperate' (maintain stable prices) or 'Defect' (initiate a price cut). The dilemma arises from the structure of the payoffs: the temptation to defect for unilateral gain (T), the reward for mutual cooperation (R), the punishment for mutual defection (P), and the sucker's payoff for being exploited (S), with the canonical ordering $T > R > P > S$. In the context of food delivery, mutual defection (price war) leads to sustained losses (P), while mutual cooperation yields sustained profits (R). However, the high short-term payoff from attracting price-sensitive users (T) and the catastrophic loss of market share from being exploited (S) make defection the dominant strategy for both players, leading inevitably to the Nash equilibrium of (Defect, Defect).

ISSN 2959-6130

Table 1. Strategic Payoff Matrix for Meituan and Ele.me

	Ele.me: Cooperate	Ele.me: Defect
Meituan: Cooperate	(R, R) Stable, moderate profits	(S, T) Meituan loses share; Ele.me gains
Meituan: Defect	(T, S) Meituan gains share; Ele.me loses	(P, P) Mutual loss from the price war

In the classic Prisoner's Dilemma, two isolated prisoners must each decide to either cooperate (stay silent) or defect (testify against the other). The optimal collective outcome (both cooperating) is unstable because each player has a powerful incentive to defect, leading to a suboptimal Nash equilibrium where both are worse off.

3.1 The Payoff Structure and Dominant Strategy

Given this structure, the dilemma becomes clear. Each platform, acting in its own rational self-interest, is compelled to choose defection.

The Incentive to Defect (The Temptation): If Meituan believes Ele.me will cooperate (keep prices moderate), Meituan's best response is to defect. Launching a price war can attract a flood of price-sensitive consumers and merchants, gaining significant market share and revenue. The same logic applies to Ele.me.

Conversely, if Meituan believes Ele.me is about to defect, its best response is still to defect. Cooperating while its rival defects would be catastrophic. Meituan would be the "sucker," losing market share, revenue, and potentially facing a long-term decline (payoff S is the worst possible outcome). Defecting, even in this scenario, mitigates the loss.

Therefore, regardless of what the other player does, the dominant strategy for each individual platform is to defect. This leads both players inevitably to the outcome (Defect, Defect) – the price war – which constitutes the Nash Equilibrium. This is a stable state because neither player can unilaterally change their strategy (e.g., raise prices) without making themselves worse off in the short term.

3.2 Barriers to Cooperation and Sustained Equilibrium

The obvious question is why the platforms don't simply communicate and agree to cooperate. The prisoner's dilemma is predicated on a lack of communication and trust. Furthermore, the threat of potential market entrants(e.g., Douyin) raises the opportunity cost of cooperation. If both incumbents reduce subsidies, they risk lowering barriers to entry, making the market attractive for new competitors. This external threat incentivizes both platforms to maintain aggressive true cost, profitability, and subsidy budgets, making it impossible to verify compliance with any tacit agreement to cooperate. Without transparency, defection cannot be reliably detected or punished, rendering any cooperative pact inherently unstable.

It may be cause by the new entering platforms, if the two firms reduce the subsidy or give less coupons to consumer, it may be easier for other small platforms to enter the market, but as the number of platforms increase then it means that the market share of both Meituan and Eleme is likely to be influenced, and this is the result that both will not accept. Also due to the data asymmetry and the lack of trust between two platforms, non of the platform can get the exact data of others, causing it is hard to decide for all platforms, they may only try to predict what other platforms may do, increase subsidy or not, and base on the prediction to make their own decision, this is mainly because of the information gap in the market, may consider to be a kind of market failure. The mistrust between platforms makes the corporation fragile.

The price war between Meituan and Eleme is not a temporary tactic but a stable, structurally determined outcome of a prisoner's dilemma. The core problem is that the rational, profit-maximizing strategy for each individual actor leads to a collective outcome that is Pareto inefficient – worse for both players than if they could find a way to cooperate. Intense market competition, legal constraints, and the fundamental mechanics of game theory lock in the current equilibrium of mutual defection. Any proposed solution must, therefore, find ways to alter the underlying payoff structure or the rules of the game itself to make cooperation a more attractive and sustainable strategy than defection. The platforms are trapped in a race to the bottom, and the first step to escaping is recognizing that the trap is not of their momentary making but is embedded in the very architecture of their competition.

4. Suggestion

4.1 Altering Payoff Structure to Incentivize Cooperation

Based on the analysis in Section 3.1, which identified "defection" as the dominant strategy for both players, leading to a stable but Pareto-inefficient Nash Equilibrium of (Defect, Defect), the following strategies are proposed. The

core objective is to fundamentally alter the payoff matrix of the game, making cooperation a more attractive or defection a less viable strategy.

4.1.1 Increasing the payoff for mutual cooperation (raising the value of 'R')

This strategy aims to make the scenario where both platforms compete on non-price factors (Cooperate, Cooperate) more profitable for each, thereby increasing the profit (R) for mutual cooperation [10].

Instead of fighting over a fixed market share, the platforms could independently but simultaneously invest in innovations that expand the total market value. Examples include jointly developing and promoting standards for sustainable delivery or investing in market education to increase overall consumption frequency. A larger, more valuable market share means that even with stable market shares, absolute profits (R) can increase, making the cooperative equilibrium more attractive. However, merely increasing R is insufficient unless simultaneously addressing the disproportionate gains from defection.

4.1.2 Reducing the temptation to defect (lowering the value of 'T')

This strategy aims to diminish the short-term benefits a platform gains when it unilaterally defects (launches a price war) while the other cooperates.

Platforms need to make their user base less susceptible to a competitor's price cuts. This can be achieved by deeply embedding their service into users' daily routines through integrated ecosystem offerings (e.g., bundling food delivery with payments, entertainment, or transportation) and creating strong brand communities based on shared values. Alibaba Group's 2024 Annual Report indicates that 88% of Ele.me's high-retention users utilize three or more services within its ecosystem, demonstrating 37% lower price sensitivity compared to single-platform users [11]. This showcases the effectiveness of ecosystem bundling in reducing the temptation to defect. When customers are loyal to the ecosystem or brand, a mere price cut from a competitor becomes a less effective lure, significantly reducing the payoff (T) for defection.

4.2 Lowering Barriers to Sustainable Competition

Addressing the barriers to cooperation identified in Section 3.2—such as the threat of new entrants, information asymmetry, and a fundamental lack of trust—requires strategies designed to lower these barriers and foster a more stable environment conducive to tacit cooperation [12].

4.2.1 Establishing strategic signaling mechanisms to counter the threat of new entrants

Both platforms should independently, yet simultaneously, invest in areas that raise the overall value and standards of the industry, such as jointly supporting an industry-wide rider welfare fund or digital transformation programs for merchants. This type of non-price competition raises industry entry barriers, making it difficult for new players to compete on price alone. When the competitive focus shifts from price to comprehensive service capability, the threat from new entrants is diminished.

4.2.2 Building transparency and information-sharing mechanisms to reduce information asymmetry

While strictly adhering to antitrust laws, the platforms can support or participate in industry health reports published by neutral third parties, such as industry associations or research institutions. These reports could share non-proprietary macro-level data. For instance, the joint publication of a 'White Paper on Food Delivery Industry Operating Costs' through a neutral body like the China E-commerce Association would demonstrate how non-collusive information sharing can establish industry benchmarks, reduce misjudgment, and benefit all stakeholders without violating antitrust norms. This helps establish objective industry benchmarks and reduces overreactions caused by misjudging the other's strategic intentions.

The proposed strategies, ranging from altering the fundamental payoff matrix to lowering operational barriers, provide a pragmatic roadmap for Meituan and Ele.me to evolve their competition from a destructive prisoner's dilemma towards a more sustainable and innovative equilibrium. The following conclusion synthesizes these findings and assesses their broader implications.

5. Conclusion

5.1 Key Findings

This study employs the Prisoner's Dilemma framework to deconstruct the persistent price war between Meituan and Ele.me. The analysis confirms that the competitive dynamics constitute a classic Nash Equilibrium, where defection (aggressive price-cutting) is the dominant strategy for both parties. This equilibrium is structurally entrenched by the payoff matrix (where $T > R > P > S$) and reinforced by significant barriers to cooperation, including severe information asymmetry, the latent threat of new entrants like Douyin, and legal constraints that prohibit explicit collusion. Consequently, both platforms are locked in a Pareto-inefficient outcome characterized by mutual financial erosion.

Despite these challenges, this analysis not only diagnoses the problem but also charts a potential escape path, which carries significant theoretical and practical implications.

ISSN 2959-6130

5.2 Theoretical and Practical Implications

This research provides a nuanced application of game theory in digital platform economics. It moves beyond theoretical modeling by empirically validating the Prisoner's Dilemma in a real-world, high-stakes market, highlighting how antitrust regulations and multi-market competition can intensify the dilemma. Practically, this study offers a strategic roadmap for platform operators trapped in similar competitive dynamics. The proposed strategies—categorized into altering the game's payoff structure and lowering the barriers to cooperation—provide actionable pathways to transition competition from destructive price-cutting to innovation-based rivalry. For policymakers, this analysis underscores the importance of fostering transparent market environments and regulating against predatory pricing while being cautious of regulations that might inadvertently reinforce non-cooperative equilibria.

5.3 Limitations and Future Research

This study is limited by its use of secondary data, such as published financial reports and industry analyses. This limits the ability to quantify the exact payoffs (T, R, P, S) or to model the decision-making algorithms that automate price-setting, which are central to the modern manifestation of this dilemma. However, the primary data, such as the process of internal decision-making of the platforms, is absent, and there is a lack of both platform and consumer perspectives. Future research should therefore prioritize obtaining granular operational data through partnerships with industry players. Furthermore, the framework could be extended through agent-based modeling to simulate competitive scenarios under different parameters. Empirically, conducting in-depth interviews with strategic decision-makers at Meituan and Ele.me could yield invaluable insights into the perceived payoffs and the credibility of commitment strategies, further refining the proposed solutions.

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