

Competing on volume or value? Reputation and timing in restaurant industry

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ABSTRACT

By considering a market competition with two asymmetric restaurants, this paper presents a comparative analysis of two dynamic duopoly models tailored to the restaurant industry, integrating principles of industrial organization and game theory. The first framework examines a Stackelberg (sequential) quantity competition where restaurants determine quality levels simultaneously before competing sequentially in output. Conversely, the second framework introduces a sequential quality competition model, wherein the smaller restaurant acts as the quality leader, while subsequent quantity decisions are made simultaneously. Both models examine how restaurant reputation shapes equilibrium quality, output, profits, consumer surplus and social welfare. By comparing two frameworks, we demonstrate that reputation asymmetry is a primary driver of market dominance and strategic positioning, though its impact is conditional on the decision-making sequence. In a Stackelberg quantity model, the high-reputation restaurant systematically dominates the market, leveraging its status to increase both quality and output while capturing superior profits. Conversely, in a sequential quality model, the timing of quality decisions serves as a strategic lever; leadership in quality can partially mitigate reputational disadvantages, allowing smaller restaurants to secure strategic gains under specific conditions. This research highlights the joint impact of reputation and decision-making sequences on market efficiency, contributing new insights to the literature on food industry competition.

Keywords: Restaurants' reputation; Food industry; Leadership

1. INTRODUCTION

The global restaurant industry is currently experiencing a profound structural transformation fuelled by increasing consumer demand for healthier diets, superior food quality and sustainable culinary practices. In this evolving competitive environment, product quality can no longer be regarded as a secondary operational concern. Instead, it has emerged as a fundamental strategic instrument, operating alongside traditional mechanisms such as pricing and output decisions.

We note that competition within the hospitality industry does not occur among homogeneous firms. Restaurants are inherently asymmetric entities, differing primarily in their reputational capital – a multidimensional asset encompassing brand value, consumer

trust, historical market performance and accumulated customer goodwill. Reputation therefore acts as an essential strategic lever in markets with asymmetric information and differentiated products, where empirical evidence demonstrates its capacity to cultivate consumer trust, shape behavioral intent and secure long-term market dominance.

The two frameworks synthesized herein deploy game-theoretic duopoly models to isolate these competitive forces (Ferreira & Koerich, 2025; Ferreira et al., 2022). While both architectures evaluate asymmetric restaurants engaging in multidimensional (quantity and quality) competition under a demand structure parameterized by reputation, they differ significantly regarding the timing of strategic decisions. The first paper develops a three-stage Stackelberg quantity competition model. Restaurants first choose quality simultaneously, after which the large restaurant acts as quantity leader and the small restaurant becomes the follower (Ferreira & Koerich, 2025). The second paper reverses the strategic sequence. The small restaurant first chooses quality as a leader, followed by the large restaurant, while quantities are determined simultaneously in the last stage (Ferreira et al., 2022).

The objective of this paper is to integrate and compare the two approaches, emphasizing: differences in strategic timing; effects of reputation asymmetry; equilibrium outcomes; welfare implications; and managerial consequences for the restaurant industry.

When deep reputational imbalances exist between firms, market outcomes are heavily dictated by the timing of strategic choices. Within industrial organization, these dynamics are formalized via two classic paradigms: simultaneous decisions in the Cournot tradition and sequential commitments in the Stackelberg tradition. While classical literature extensively explores these dynamics under uniform production conditions, there is a critical gap in understanding how reputation gaps interact with a firm's choice to lead on volume (quantity) versus leading on value (quality).

2. LITERATURE REVIEW

The theoretical foundations of both studies considered in the present study are rooted in classical oligopoly theory and game theory. The paradigm of simultaneous quantity competition originates from Cournot (1838), while Stackelberg (1934) pioneered the sequential framework by introducing the leader-follower structure. These foundational concepts remain central to the fields of industrial organization and strategic management. Extant literature frequently operates endogenous leader-follower dynamics through timing games in oligopolistic markets. A foundational contribution by Hamilton and Slutsky (1990) introduced an 'extended game' framework that endogenizes the chronological sequence of moves by allowing firms to strategically select their production timing.

Modern literature has significantly extended these baseline models by integrating multidimensional strategies, including endogenous quality decisions and product differentiation, reputation effects and their impact on consumer welfare, strategic timing and move-order choices, between others.

Within this broader context, recent studies have explored these intersecting dynamics. For instance, Kurokawa and Matsubayashi (2018) examined price and quality competition under vertical differentiation, while Luca and Reshef (2020) demonstrated that pricing decisions significantly influence firm reputation. Because firms maintain strategic agencies over their price, quantity, and product quality parameters simultaneously, industrial managers must

evaluate these three dimensions as the core determinants of market positioning (Lambertini & Tampieri, 2017). Specifically, within the food industry, Chen et al. (2018) analyzed quality competition under capacity constraints, concluding that reputation strongly dictates equilibrium quality and output.

Chen and Nie (2016) examined a mixed duopoly framework in the food sector, modeling the interaction between a profit-maximizing firm and a Corporate Social Responsibility (CSR) – driven competitor.

Operating under a two-stage game structure, restaurants select quality profiles in the first stage before simultaneously determining output quantities in the second. The analysis reveals that prioritizing CSR serves as a catalyst for the socially responsible restaurant, increasing both its equilibrium quality and output, while simultaneously crowding out the performance metrics of its profit-maximizing rival.

The two papers synthesized in this study advance this body of literature by introducing distinct sequential architectures into the interplay of quality and quantity competition (Ferreira & Koerich, 2025; Ferreira et al., 2022).

3. METHODOLOGY

To systematically examine how the timing of strategic decisions interacts with reputational capital, this section first outlines the shared microeconomic foundations of both models and subsequently highlights the differences in their respective multi-stage game structures.

3.1. COMMON MICROECONOMIC FOUNDATIONS

Both frameworks are built upon a game-theoretic duopoly consisting of two asymmetric competitors: a small restaurant R1 and a large restaurant R2. Market demand is derived from a representative consumer maximizing a quadratic utility function that accounts for both volume and product quality.

- The resulting inverse demand system incorporates three primary structural components:
- Base reputational capital: A baseline willingness-to-pay shared across the industry.
- Reputation asymmetry (α): A parameter capturing the brand equity advantage of the large restaurant over its smaller rival.
- Product Substitutability (β): The extent of product substitutability characterizing the two restaurants.

Consequently, the inverse demand functions depend positively on a firm's own quality investments and negatively on the competitor's output volume. On the supply side, both models share an identical quadratic cost structure that features production costs, quality research and development (R&D) expenditures and interaction costs between quality and quantity. Both models are solved for Subgame Perfect Nash Equilibrium, employing backward induction to ensure the time-consistency of the firms' strategic choices across each stage.

3.2. STRATEGIC TIMING AND MOVE-ORDER FRAMEWORK

The fundamental divergence between the two frameworks lies in the chronological sequencing of strategic choices, which transforms the nature of market leadership:

Model 1: Sequential quantity competition (Stackelberg volume leadership): In this three-stage game, quality is determined simultaneously, followed by a sequential quantity

subgame where the large restaurant acts as the Stackelberg leader and the small restaurant as the follower.

Model 2: Sequential quality competition (value leadership): This configuration reorients the strategic commitment from volume to value. The small restaurant moves first to establish product quality, followed by the large restaurant's quality decision, before both firms compete simultaneously on quantity in the final stage.

4. EQUILIBRIUM RESULTS

To examine how these alternative temporal structures affect firm behavior and market dynamics, this section analyzes the equilibrium outcomes and comparative static results derived independently from each model.

4.1. RESULTS FROM THE STACKELBERG QUANTITY MODEL (MODEL 1)

Equilibrium results from the initial framework reveal that under sequential quantity competition, reputation asymmetry systematically reinforces the position of the dominant firm.

At the Subgame Perfect Nash Equilibrium (SPNE), the large restaurant capitalizes on – holding both the structural reputation premium and first-mover quantity status – to consistently outpace its rival, whereas the large restaurant offers superior food quality, commands a larger market share through greater output volume, and realizes strictly higher profits.

Evaluating the system's sensitivity to shifts in the reputation gap (τ) yields the following comparative statics:

- *Asymmetric firm responses:* An intensifying reputation gap serves as a catalyst for market divergence. The large restaurant leverages its position to aggressively expand its quality and supply footprint, while the smaller rival faces marginalization, suffering absolute declines across both quality and quantity dimensions.
- *Aggregated market and welfare expansions:* The dominant firm's scale-up more than offsets the smaller firm's withdrawal, leading to a net increase in aggregate output and quality. This lowers consumer costs and enhances market utility, leading to consistent gains in consumer surplus and social welfare.
- *The reputation paradox:* A notable finding is that an widening reputational disparity increases the absolute profits of both restaurants. Despite the small restaurant's strategic retreat, the positive demand externalities created by the large restaurant's superior reputation more than compensate for the loss in market share, resulting in higher net earnings for both firms.

Finally, comparing this sequential framework against a baseline simultaneous Cournot structure reveals distinct trade-offs:

$$\text{Small restaurant profits: } \pi_1^{\text{Cournot}} > \pi_1^{\text{Stackelberg}}$$

$$\text{Large restaurant profits: } \pi_2^{\text{Stackelberg}} > \pi_2^{\text{Cournot}}$$

$$\text{Social welfare: } W^{\text{Stackelberg}} > W^{\text{Cournot}}$$

These relationships indicate that while sequential quantity leadership exacerbates market concentration and disadvantages the smaller player, it simultaneously maximizes aggregate economic efficiency.

4.2. RESULTS FROM THE SEQUENTIAL QUALITY MODEL (MODEL 2)

The second framework introduces value-based commitment, yielding a more nuanced set of strategic equilibria. While the large restaurant generally maintains its volume advantage due to its structural reputation premium, allowing the small restaurant to act as the first-mover in quality decisions fundamentally reconfigures the prevailing power dynamics of market power.

The key findings from this sequential quality structure include:

- *Strategic equalization and profit inversion:* Most notably, when the reputational disparity is sufficiently marginal, the smaller restaurant's first-mover advantage in quality enables it to offset its structural deficit and secure higher equilibrium profits than its larger competitor. This result highlights a key departure from the Stackelberg quantity model, in which the dominant firm invariably captures higher profits regardless of the parameter space.
- *Complex profit trajectories:* Comparative static analysis indicates that while an expanding reputation gap invariably penalizes the profits of the small quality leader, the impact on the large follower is non-monotonic. The latter's profit margin may expand, or contract based on the initial degree of asymmetry. Conversely, total market output and collective quality remain positively correlated with the reputation gap.
- *Non-linear welfare dynamics:* In contrast to the linear welfare improvements observed in the quantity-led model, this framework reveals a non-linear, U-shaped relationship for both consumer and social welfare. When the reputational disparity is minimal, an initial widening of the asymmetry causes consumer surplus and social welfare to diminish. However, once the reputation gap surpasses a critical threshold, further divergence reverses this trajectory, triggering a subsequent expansion in both welfare metrics.

This welfare curve reveals a trade-off: quality leadership by small restaurants supports diversity, but its benefit to consumers and social efficiency depends entirely on the size of the reputation gap.

5. COMPARATIVE DISCUSSION

By comparing the equilibrium outcomes of both frameworks, this discussion demonstrates how modifications in the temporal structure of the game fundamentally transform the strategic role of reputation and, consequently, its effects on market performance and social welfare.

5.1. STRATEGIC LEADERSHIP AND MARKET POWER

The fundamental divergence between the two frameworks lies in the operational nature of market leadership and the strategic variable used to establish it. Under the Stackelberg quantity model (Model 1), the dominant restaurant leverages volume-based commitment to solidify its position. This dynamic intensifies market polarization, allowing competitive advantages to aggregate existing reputational equity and consolidating the large firm's dominance.

In contrast, the sequential quality model (Model 2) reorients the strategic focus from volume to value. By securing a first-mover advantage in quality design, the smaller restaurant

employs strategic commitment to establish a competitive buffer against the dominant firm's market power. This value-led architecture partially mitigates the smaller restaurant's structural reputation deficit, fostering a more equitable competitive landscape. These findings illustrate that early-stage quality leadership can serve as a potent compensatory mechanism for smaller firms seeking to neutralize an incumbent's established brand equity.

5.2. REPUTATION AS A COMPETITIVE ASSET

Both studies corroborate that reputational capital serves as a primary determinant of market demand, pricing power, production volume, and net welfare. However, the strategic utility of this asset is conditional upon the specific decision-making sequence within the game.

In the quantity-led framework, reputation functions as a linear amplifier of market dominance: any widening of the reputational gap systematically enhances the leading firm's market share, quality profile and profitability. Conversely, within the quality-led framework, the strategic returns on reputation are both conditional and non-linear. In this context, an expanding reputation gap does not guarantee immediate competitive advantages for the dominant firm; rather, its impact is heavily contingent upon the baseline level of market asymmetry. This distinction is especially vital for the service and hospitality sectors, where branding, consumer trust and quality signaling serve as the primary determinants of market entry and long-term survival.

5.3. WELFARE AND EFFICIENCY IMPLICATIONS

The synthesis of these models reveals a striking paradox regarding market efficiency and social welfare. The first model indicates that increasing market asymmetry can drive positive macroeconomic outcomes, yielding monotonic expansions in total output, aggregate quality investments, consumer surplus, and overall social welfare. In this environment, the aggressive expansion of the dominant firm benefits the consumer through sheer volume and high baseline standards, even as it marginalizes the smaller competitor.

The second model introduces a more sophisticated, non-linear welfare landscape: when the reputational disparity is relatively marginal, the strategic distortions precipitated by the smaller restaurant's quality leadership erode both net consumer surplus and social welfare. However, once the asymmetry surpasses a critical threshold, scale efficiencies predominate, triggering a recovery and subsequent rise in both welfare metrics. Ultimately, these divergent results imply that the traditional economic relationship between market concentration and allocative efficiency cannot be evaluated in isolation; rather, it is fundamentally contingent upon the endogenous timing and chronological sequence of firm decisions.

6. MANAGERIAL AND POLICY IMPLICATIONS

The contrasting market equilibria of these two frameworks yield distinct, actionable insights for hospitality operators, brand managers and competition authorities.

6.1. STRATEGIC IMPERATIVES FOR SMALL AND INDEPENDENT RESTAURANTS

The sequential quality framework (Model 2) establishes that reputational inferiority is not a terminal condition for smaller market participants. By prioritizing quality-led commitment, these firms can construct a strategic foothold that mitigates the dominant firm's volume-based superiority, reclaiming a degree of market agency.

- *Strategic Recommendations: First-Mover Quality Commitment* - Rather than adopting a reactive stance toward market volume, smaller firms should position themselves as quality pioneers. By initiating early, visible commitments to high-value dimensions,

such as organic supply chains, specialized culinary nutrition, or verifiable sustainability practices, they establish an operational anchor to which larger followers must subsequently adapt.

- *Strategic Recommendations: Niche Differentiation and Premium Positioning* - By seizing the lead in quality design, smaller restaurants can de-escalate destructive volume-based competition and pivot toward premium, high-margin niches. In these segments, consumer willingness to pay is driven by perceived value rather than mere brand ubiquity.

6.2. STRATEGIC IMPERATIVES FOR SMALL AND INDEPENDENT RESTAURANTS

leadership as the optimal strategy for monetizing brand prestige. By leveraging scale, these firms can effectively convert their reputational advantage into sustainable economic rents.

- *Strategic Recommendations: Exploiting Quantity Leadership* - Under a quantity-led regime, the dominant firm should utilize its reputational assets to enforce a Stackelberg leadership position. By committing to aggressive output levels, the incumbent induces a contractionary response from smaller rivals, thereby maximizing its own rent extraction and market saturation.
- *Strategic Recommendations: Sustaining the Reputation Premium* - Given that profit functions in both regimes are monotonically increasing in the reputational differential, the dominant firm should endogenize its scale advantages to reinforce brand equity. Continuous reinvestment in broad-spectrum quality standards and visibility effectively hardens the structural asymmetry, raising the barriers to entry for late-stage competitors.

6.3. GUIDELINES FOR ANTITRUST AUTHORITIES AND REGULATORY POLICYMAKERS

These findings disrupt traditional regulatory paradigms, proving that static assumptions regarding market concentration are insufficient for predicting consumer welfare outcomes in dynamic, sequential environments.

- *Policy Implications: The Concentration-Efficiency Paradox* - This analysis uncovers a concentration-efficiency paradox, suggesting that market dominance by a reputable restaurant can be a vehicle for, rather than a barrier to, social utility. Under specific conditions, the scale-driven expansion of a leader harmonizes market concentration with welfare maximization by institutionalizing higher quality standards and logistical efficiencies.
- *Policy Implications: Structure and Timing Over Scale* - Timing matters as much as size. Regulators need to look at the order of strategic moves, not just market share, to see how reputation-based rivalry pushes firms to invest more in quality and R&D.
- *Policy Implications: Balanced Intervention* - Policymakers should transition from a structure-based toward a conduct-based intervention strategy. By subsidizing or standardizing quality-signaling mechanisms for smaller entities, regulators can neutralize the 'reputation gap' barrier to entry. This approach preserves competitive contestability while allowing the market to capture the welfare gains associated with the leader's scale economies.

7. CONCLUSIONS

This paper has provided a systematic synthesis and comparative analysis of two dynamic duopoly frameworks applied to the restaurant industry, isolating how reputational asymmetry interacts with a firm's choice of strategic variable and chronological move-order. By contrasting a model of sequential quantity competition (with simultaneous quality selection) against a model of sequential quality competition (with simultaneous quantity

selection), we demonstrate that strategic timing and choice variables fundamentally dictate competitive and structural outcomes in food markets.

The comparative analysis reveals that the value and leverage of brand equity are highly contingent upon the game's architecture. Under the volume-led framework, sequential quantity choices reinforce the market dominance of the already high-reputation firm. This configuration drives a highly concentrated market structure that, paradoxically, maximizes aggregate economic efficiency, consumer surplus, and overall social welfare via massive scale expansions. Conversely, the value-led framework demonstrates that sequential quality positioning functions as an operational equalizer. By establishing an early, credible commitment to quality, a smaller, lower-reputation establishment can mitigate reputational inferiority, neutralize a rival's scale advantage, and secure superior equilibrium profits within certain reputational thresholds.

Finally, both frameworks confirm that reputational capital remains a primary determinant of pricing leverage, market share, and long-term survival within the hospitality sector. However, the analysis demonstrates that the precise interplay between a firm's reputation and its decision timing determines whether that reputation functions as an insurmountable barrier to entry or a mechanism through which smaller restaurants can execute effective strategic retaliation. By examining these multidimensional interactions, this study contributes to the literature on industrial organization, applied game theory and hospitality economics, offering a more nuanced understanding of how strategic timing and quality differentiation jointly influence market efficiency, competitive behavior and welfare outcomes in the contemporary food industry.

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Conceptualization, FF, FAF, YCM, RRF, and MP; methodology, FF, FAF, YCM, RRF, and MP; formal analysis, FAF, YCM, RRF, and MP; investigation, FF, FAF, YCM, RRF, and MP; writing—original draft preparation, FF and FAF; writing—review and editing, FAF, YCM, RRF, and MP; supervision, FF; funding acquisition, FF and FAF. All authors have read and agreed to the published version of the manuscript.

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CONFLICT OF INTEREST

The authors declare no competing interests.

DATA AVAILABILITY STATEMENT

Data supporting the findings of this study are available upon reasonable request.

ETHICS STATEMENT

This study did not involve human participants or animals and therefore did not require ethical approval.

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DECLARATION ON THE USE OF GENERATIVE AI

ChatGPT-4 (OpenAI) was used exclusively for linguistic revision. The tool was not employed for content generation, data analysis, or interpretation. Full responsibility for the accuracy and integrity of the content remains with the authors.