

Effects of Restaurants' Reputation and Leadership in the Restaurant Industry, Under Quality and Price Competition

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ABSTRACT

This paper explores the effects of reputation and leadership dynamics within the restaurant industry, focusing on how these factors influence competition in quality and price. Using a three-stage dynamic model, where restaurants first determine quality in two stages and then set prices, this study aims to analyse the interactions between higher-reputation and lower-reputation establishments. The findings suggest that the leadership position assumed by the lower-reputation restaurant can be advantageous, allowing the leader to surpass the follower in profitability. Additionally, a widening reputation gap increases total market output, although the effects on both consumer surplus and social welfare remain ambiguous. Reputation emerges as a critical asset, shaping not only consumer perceptions but also operational strategies and competitive outcomes within the industry. This paper enhances the understanding of reputation dynamics within the restaurant industry. Grasping these dynamics is crucial for managers aiming to optimize competitive strategies and boost both profitability and customer satisfaction.

Keywords: Gastronomic tourism; Restaurants' reputation; Leadership; Price competition; Quality competition; Game theory.

1. INTRODUCTION

Price, quantity and quality are main factors that should be taken into account by industrial managers (Lambertini & Tampieri, 2017). Kurokawa and Matsubayashi (2018) explored price and quality competition between two firms, with quality positions based on a vertical differentiation model, where the firms have given quality positions and must incur repositioning costs that are convexly proportional to the difference between the quality positions and the product quality levels they set. By analyzing this model, they obtained insights into the competitive effects of these factors. Luca and Reshef (2021) studied the impact of price on firm reputation, as measured by its online ratings. Their results are consistent with the cross-sectional evidence and suggest

that higher prices are in fact affecting a restaurant's reputation. Reputation is an important issue also in hotel management, as was analysed by Mariño-Romero et al. (2017).

Interest in gastronomic tourism has grown steadily in recent years. The UN Tourism Committee on Tourism and Competitiveness (CTC) defines Gastronomy Tourism as a form of travel centered around the visitor's experience with food and related products and activities. In addition to authentic, traditional, and/or innovative culinary experiences, Gastronomy Tourism can also include activities such as visiting local producers, attending food festivals, and participating in cooking classes (UN Tourism, n.d.).

Food quality has gained significant attention worldwide, making it essential for food industry managers to prioritize quality while also considering reputation and pricing. This paper focuses on price and quality competition within the restaurant industry, using a two-stage dynamic duopoly model, commonly used in industrial organization studies. In the first stage, both restaurants simultaneously select their quality levels, followed by setting their prices. The study also examines how a restaurant's reputation impacts equilibrium outcomes. A strong reputation is a valuable asset, enabling a firm to achieve consistent profitability and high financial performance. Additionally, a well-reputed firm may benefit from a cost advantage, as employees are more likely to prefer working for high-reputation companies, all else being equal (Roberts & Dowling, 2002).

Li et al. (2023) highlight how competitive pressures can drive reputation management tactics in the restaurant industry, particularly when restaurants face direct competitors in terms of cuisine type and pricing tiers.

In this paper, we examine a market consisting of two asymmetric restaurants that compete non-cooperatively on both quality and price. The study has two objectives: first, to determine the decisions that maximize profits; and second, to analyze the impact of differences in the restaurants' reputations. The key concepts of duopoly (a market with only two firms) are closely tied to strategic behavior, which lies at the heart of Game Theory. Game Theory explores mathematical models that represent strategic interactions between rational decision-makers.

This paper aims to contribute in gastronomic tourism, by analysing a competitive economic model between two asymmetric restaurants. We consider two main keys in the model: leadership and restaurants' reputation. The results of the study help to understand the effects of the reputation of restaurants on their economic performance.

This paper is organized as follows: Next section presents a brief literature review related to the topic of the paper. Then, we describe the model and explain the methodology used. After that, we present and discuss the results. The paper concludes in the final section.

2. LITERATURE REVIEW

The decision-making process in restaurants involves more than simply choosing what to eat. Consumers consider multiple factors when choosing a restaurant, including hygiene, ambiance, decor, location, view, reputation, food and beverage quality, portion size, taste, temperature, presentation, prices, service speed, unique dining experiences, menu variety, handling of complaints, staff interactions, and reservation process (Cullen, 2005). The quality of a restaurant's physical environment, food, and service plays a crucial role in shaping its image, while perceived value influences both the environment and food quality (Ryu et al., 2012). Additionally, restaurant ratings have become increasingly important in shaping consumer preferences (Bertan, 2020).

In recent years, studies dealing with subjects like food related health, hygiene, culinary, safety, tourism, culture and education have been increasing in number especially in gastronomic tourism (Okumus et al., 2018).

Gastronomic identity is crucial in destination marketing, particularly where food quality is regarded as exceptional. Quality is a key factor because it directly influences tourists' purchase decisions. As a result, high-quality food has strong potential to become a primary reason for visiting a destination, especially since it attracts selective tourists willing to spend more on unique, high-value, and premium products (Shalini & Duggal, 2015).

Gastronomic identity plays an important role in destination marketing, especially where food quality is considered exceptional. The issue of quality is also an important topic because this directly affects tourists' purchase intentions. Therefore, high-quality food has a great potential for expansion as a primary motive for visiting a tourism destination, especially because it attracts very selective groups of tourists with extra money to spend on high-value, unique, and high-quality products (Shalini & Duggal, 2015).

Several researchers have focused on the study of the food industry.

Nie and Chen (2014) studied an oligopoly model in the food industry, where firms offer identical products and compete by setting quantities simultaneously. Their results showed that as the number of firms grows, both the output per firm and food prices decline. Furthermore, each firm's profits decrease with the entry of more competitors, while social welfare increases as additional firms join the market.

Yang and Nie (2016) investigated asymmetrical competition in the restaurant industry, emphasizing product substitutability through a two-step game model. They analyzed the equilibrium outcomes using both Cournot and Stackelberg models.

Chen and Nie (2016) investigated mixed duopoly competition in the restaurant industry, involving one profit-focused firm and another that integrates corporate social responsibility (CSR) into its objectives. In their model, both firms first choose the quality of their products, followed by setting quantities, with decisions made simultaneously at each stage. The study found that CSR

improves both the quality and quantity of food offered by the CSR-oriented firm, while it reduces these factors for the profit-driven firm.

Chen et al. (2018) emphasized the impact of capacity constraints on the quality and quantity within the restaurant industry, dividing consumers into two categories: price-sensitive and quality-sensitive. They examined two competing restaurants in a two-stage dynamic model, where both restaurants first make decisions regarding quality, followed by determining their optimal quantity. Ferreira et al. (2021) explored the same market issue but focused on price strategies rather than quantities.

Ferreira et al. (2022) studied a food market with two restaurants of varying reputations, competing first in quality and then in quantity. In the quality stage, the restaurant with the lower reputation assumes a leadership role, while in the quantity stage, both restaurants make decisions simultaneously. Their results showed that the smaller restaurant's leadership can be beneficial, with its profit exceeding that of its competitor when the reputation gap is small. They also found that a reputation disparity leads to higher total investments in quality and greater overall output at equilibrium.

3. METHODOLOGY

Economic theories are essential as they enable economists to analyze and forecast the behavior of financial markets and the broader economy. They also offer valuable insights into the functioning of the economy and how it may react to policy changes or other influencing factors.

We will conduct our research using a game theory model integrated into the decision-making process. This model represents a scenario where various actors pursue their individual interests to maximize profits, with the overall payoff being determined by the collective actions of all participants. To manage the complexity of the research, we limit the study to two restaurants. The proposed methodology involves modeling non-cooperative competition using concepts from game theory.

Game Theory seeks to explain situations where decision-makers interact. It is a formal mathematical discipline that analyzes scenarios involving competition and cooperation between multiple parties. Originally developed to better understand economic behavior (Gibbons, 1992), Game Theory became an established field after the publication of the landmark work *Theory of Games and Economic Behavior* in 1944, authored by mathematician John von Neumann and economist Oskar Morgenstern. A game consists of three key elements: (i) a set of players; (ii) a set of actions available to each player; and (iii) preferences for each player over the set of possible actions. A critical aspect of game theory is rational choice, where each player selects the best action based on their preferences from the available options. Regarding preferences, it is assumed that when presented with two actions, the decision-maker can determine which action is preferred or if both are equally desirable, indicating indifference between the two. Typically,

preferences are represented by a payoff function, which assigns a numerical value to each action, with higher numbers indicating more preferred choices.

Consider a market consisting of two restaurants — a less reputable restaurant R_1 and a more reputed one R_2 — that compete based on their decisions regarding quality and price.

Following the market structure of Chen et al. (2018), the representative consumer maximizes $U(q_i, x_i) - p_1 q_1 - p_2 q_2$, where q_i is the quantity offered by restaurant R_i , x_i is the quality associated with restaurant R_i , and p_i is its price, with $i = 1, 2$ (see also Ferreira et al., 2021). The function U , which depends on both quantity and quality, is defined by

$$U(q_i, x_i) = (\alpha + \beta x_1) q_1 + (\alpha + (\beta + \tau) x_2) q_2 - \frac{1}{2}(q_1^2 + q_2^2) - \gamma q_1 q_2$$

In the function U above, α is a positive constant, β represents the baseline reputation, τ denotes the reputation difference between the two restaurants², and γ measures the degree of product substitutability between the two restaurants. For simplicity, we fix the reputation parameter of the less reputed restaurant equal to $5/2$, and we assume $\gamma = 1/2$. We focus our attention on the difference in reputations. The function U can now be rewritten as

$$U(q_i, x_i) = \left(\alpha + \frac{5}{2} x_1\right) q_1 + \left(\alpha + \left(\frac{5}{2} + \tau\right) x_2\right) q_2 - \frac{1}{2}(q_1^2 + q_2^2) - \frac{1}{2} q_1 q_2$$

Thus, the inverse demand functions of the two restaurants are given by

$$p_1 = \alpha + \frac{5}{2} x_1 - q_1 - \frac{1}{2} q_2,$$

$$p_2 = \alpha + \left(\frac{5}{2} + \tau\right) x_2 - \frac{1}{2} q_1 - q_2$$

The total costs for both fewer and more reputed restaurants depend on quantity and quality, as defined by:

$$C_i = \frac{1}{2} q_i^2 + \frac{1}{2} x_i^2 + q_i x_i,$$

$i = 1, 2$. The first and second terms represent the costs associated with investment in quantity and quality, respectively, while the final term reflects the interaction between quantity and quality investments.

² To obtain feasible real solutions, we assume.

As a result, the profit π_1 of the less reputed restaurant R_1 is expressed as

$$\pi_1 = \left(\alpha + \frac{5}{2}x_1 - q_1 - \frac{1}{2}q_2 \right) q_1 - \frac{1}{2}q_1^2 - \frac{1}{2}x_1^2 - q_1x_1,$$

and the profit π_2 of the most reputed restaurant R_2 is given by

$$\pi_2 = \left(\alpha + \left(\frac{5}{2} + \tau \right) x_2 - \frac{1}{2}q_1 - q_2 \right) q_2 - \frac{1}{2}q_2^2 - \frac{1}{2}x_2^2 - q_2x_2.$$

Social welfare W is defined by

$$W = CS + \pi_1 + \pi_2,$$

where

$$CS = \frac{1}{2}(q_1^2 + q_2^2) + \frac{1}{2}q_1q_2$$

represents the consumer surplus.

The model is developed through a three-stage game structure:

- In the first stage, the less reputed restaurant R_1 chooses its quality level x_1 ;
- In the second stage, the most reputed restaurant R_2 chooses its quality level x_2 ;
- In the third stage, both restaurants decide, simultaneously, their optimal food prices p_1 and p_2 .

4. RESULTS AND DISCUSSION

In this section, we will examine the previously described model. The game is solved by backwards induction, through mathematical calculations. Those calculations give the following results at equilibrium:

- Quality levels:

$$x_1 = \frac{660\alpha(40\tau^2 + 120\tau - 27)(440\tau^2 + 1320\tau - 63)}{f_0(\tau)},$$

$$x_2 = \frac{1980\alpha(-2\tau - 3)(440\tau^2 + 1320\tau + 171)}{f_0(\tau)},$$

Where $f_0(\tau) = 6001600\tau^4 + 36009600\tau^3 + 50442480\tau^2 - 10715760\tau - 104409$.

- Food prices:

$$p_1 = \frac{\alpha f_1(\tau)}{f_0(\tau)}, \quad p_2 = \frac{9\alpha f_2(\tau)}{f_0(\tau)},$$

where $f_1(\tau) = 26523200\tau^4 + 159139200\tau^3 + 218449440\tau^2 - 60778080\tau - 2357019$ and
 $f_2(\tau) = -193600\tau^3 - 1231560\tau^2 - 2027520\tau - 252909$.

- Quantities:

$$q_1 = \frac{4\alpha f_3(\tau)}{f_0(\tau)}, \quad q_2 = \frac{4212\alpha(-440\tau^2 - 1320\tau - 171)}{f_0(\tau)},$$

where $f_3(\tau) = 2129600\tau^4 + 12777600\tau^3 + 17629920\tau^2 - 4609440\tau + 176337$.

- Restaurants' profits:

$$\pi_1 = \frac{20\alpha^2 f_4(\tau)}{f_0(\tau)}, \quad \pi_2 = \frac{1620\alpha^2 f_5(\tau)}{(f_0(\tau))^2},$$

where $f_4(\tau) = 193600\tau^4 + 1161600\tau^3 + 1686960\tau^2 - 166320\tau + 3969$ and
 $f_5(\tau) = -937024000\tau^6 - 8433216000\tau^5 - 25486084800\tau^4 - 26418268800\tau^3$
 $- 26418268800\tau^3 - 1398264120\tau^2 + 839001240\tau + 81845559$.

- Consumer surplus:

$$CS = \alpha^2 \left(\frac{968}{961} - \frac{f_6(\tau)}{961(f_0(\tau))^2} \right),$$

where

$$f_6(\tau) = 16848(973099424000\tau^6 + 8757894816000\tau^5 + 25266932697600\tau^4$$

$$+ 20233173945600\tau^3 - 8935746995340\tau^2 + 375056274780\tau - 13868823321).$$

- Social welfare:

$$W = \alpha^2 \left(\frac{1581}{961} - \frac{f_7(\tau)}{961(f_0(\tau))^2} \right),$$

where

$$f_7(\tau) = 2916(3757721792000\tau^6 + 33819496128000\tau^5 + 96858494884800\tau^4 + 73858527388800\tau^3 - 40613042198520\tau^2 + 2360697882840\tau - 118778194503).$$

Based on these quantitative findings, we can derive additional results, which are presented below.

Proposition 1. The most reputable follower restaurant offers a higher quantity of superior-quality food compared to its competitor. Moreover, the profit of the less reputed leader restaurant may be either higher or lower than that of the most reputable follower restaurant, depending on the difference in reputation between the two establishments.

So, we see that the best-known or most respected restaurant provides more food, and the food is of better quality, compared to another restaurant. It emphasizes both the greater quantity and superior quality of the food offered by the reputable restaurant in comparison to its competitor. Moreover, the profit of a less well-known restaurant that takes a leadership role in its market could be either greater or smaller than the profit of a highly reputed restaurant that follows market trends. The key factor determining which one earns more depends on how large the gap in reputation is between the two restaurants. If the reputation difference is significant, the highly reputable follower may earn more due to customer trust, brand value, etc. However, if the reputation difference is small, the less reputed leader may earn more by capitalizing on its leadership position, innovation, or other factors.

Proposition 2. A growing reputation gap between restaurants leads to improved food quality at the less reputed leader establishment. However, the impact of this widening gap on the food quality of the most reputed follower restaurant is ambiguous.

Furthermore, an increasing reputation gap between restaurants has an unclear impact on the quantity of food offered by each establishment. However, the overall trend results in an increase in the total output within the market.

The statement above describes how changes in reputation between restaurants affect their food quality and quantity:

- a) *Food Quality at Less Reputed Leaders:* As the reputation gap between restaurants widens, the less reputed restaurant that takes a leadership role tends to improve its food quality. This could be because the less reputed restaurant feels the need to enhance its offerings to compete or distinguish itself.

- b) *Food Quality at More Reputed Followers*: The effect of a widening reputation gap on the food quality of the most reputed follower restaurant is unclear. It's not obvious whether this restaurant will maintain, improve, or decrease its food quality as the gap grows.
- a) *Food Quantity*: The impact of an increasing reputation gap on the quantity of food offered by each restaurant is also uncertain. It's not clear how the widening gap influences how much food each restaurant provides.
- b) *Overall Market Output*: Despite the ambiguity about individual restaurant quantities, the overall trend is that the total amount of food produced and offered in the market increases. This means that even though the effect on each restaurant's food quantity is ambiguous, the overall market sees more food being made available.

Proposition 3. The increase in the difference of restaurants' reputation raises prices of the less reputed (leader) establishment. Furthermore, reputation difference of the advantage restaurant raises (resp., reduces) its food price, if the reputation is generous (resp., small).

Thus, as the reputation gap between restaurants grows, the less reputed restaurant that is in a leadership role tends to raise its prices. This might be because the restaurant sees an opportunity to capitalize on its unique position or improved quality. On the other hand, the effect of a growing reputation gap on the prices of the most reputed (follower) restaurant is ambiguous.

Proposition 4. The increase in the difference of restaurants' reputation raises (resp., reduces) both consumer surplus and social welfare, if the reputation difference is small (resp., generous).

The statement above explains how changes in the reputation gap between restaurants affect consumer surplus and social welfare:

- a) *Small Reputation Difference*: If the gap in reputation between restaurants is small, an increase in this difference tends to raise both consumer surplus and social welfare. This could be because consumers benefit from having more options and potentially better quality at the less reputed restaurant, while the overall market dynamics improve.
- b) *Large Reputation Difference*: If the reputation gap is large, an increase in this difference tends to reduce both consumer surplus and social welfare. A large reputation gap might mean that the less reputed restaurant's higher prices or lower quality lead to reduced consumer benefits, and the market becomes less balanced.

5. CONCLUSIONS

This paper has explored the effects of restaurants' reputation and leadership on competition dynamics within the restaurant industry. Our analysis highlights some key findings.

A restaurant's reputation plays a crucial role in determining its competitive advantage. Although a higher-reputation restaurant can leverage its brand value to attract customers, gain consumer

trust, and maintain a steady market position, we saw that lower-reputation restaurants can still outperform their competitors under certain conditions.

Surprisingly, lower-reputation restaurants that take a leadership role in quality decisions can often achieve higher profitability. This suggests that leadership in quality-setting provides strategic benefits, allowing these restaurants to gain market traction despite having a less established reputation.

Our findings show that an increasing gap in reputation between restaurants leads to higher food quantity in the market. However, its effect on quality and pricing strategies is less clear. Although lower-reputation leaders tend to raise quality and prices as the reputation gap widens, the impact on more reputable followers remains ambiguous. This ambiguity is also verified in both consumer surplus and social welfare.

So, reputation and leadership are critical factors shaping competition in the restaurant industry. Lower-reputation restaurants can thrive by strategically positioning themselves as quality leaders, while higher-reputation establishments must continuously innovate to maintain their advantage. Understanding these dynamics is essential for restaurant managers seeking to optimize their competitive strategies and enhance both profitability and customer satisfaction.

This paper has inherent limitations, as it relies on an economic theoretical model that may overlook certain critical aspects of the issue, such as potential externalities.

Future research could expand these models by exploring varying decision-making timeframes and incorporating additional decision variables, such as meal quantities, to capture a broader range of strategic choices.

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