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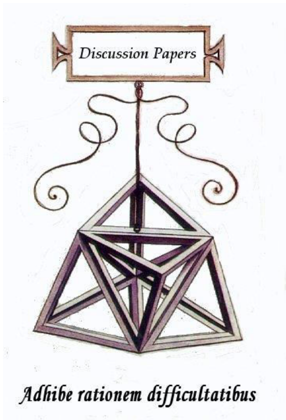

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Does Excellence Pay Off? Theory and Evidence from the Wine Market

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Does Excellence Pay Off?
Theory and Evidence from the Wine Market*

Stefano Castriota[a] Alessandro Fedele[b]

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Abstract

We investigate the effect of product excellence on firm profitability in a competitive market with vertical and horizontal differentiation. We develop a theoretical model and derive conditions under which the effect of excellence on profitability, the latter defined as the ratio of equilibrium profits to the invested capital, can be either positive, zero, or negative. We test our theoretical predictions by examining a sample of 1,052 Italian wineries over the period 2006-2015. Using different econometric methodologies, we find that excellence, proxied by firm reputation for quality, has no significant impact on profitability, measured by the return on invested capital (ROIC). We conclude by discussing policy and managerial implications.

Keywords: product excellence; firm profitability; vertical and horizontal differentiation; reputation for quality; wine market.

JEL Codes: L15 (Information and Product Quality • Standardization and Compatibility), L14 (Transactional Relationships • Contracts and Reputation • Networks), L66 (Food • Beverages • Cosmetics • Tobacco • Wine and Spirits), L13 (Oligopoly and Other Imperfect Markets), Q1 (Agriculture), D21 (Firm Behavior: Theory), D22 (Firm Behavior: Empirical Analysis).

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1 Introduction

Product differentiation is widely considered to be a strategic key to attaining competitive advantage over rivals (e.g., Porter 1980). The irresistible rise of e-commerce and digital devices providing always-on access to the web has boosted the consumer ability to learn about products and to do comparison shopping. The resulting stronger product market competition is making differentiation more crucial than ever to avoid losing competitive advantage.[1] Traditionally, two differentiation strategies are adopted by firms; investing in the quality of a product so that it is considered to be better by consumers - vertical differentiation - and/or supplying varieties of a product that are perceived as unique, rather than better - horizontal differentiation.

In this paper, we jointly consider vertical and horizontal differentiation in competitive markets and investigate how their interplay affects the profitability of firm investments in product quality.

There exists a mature literature studying the link between product excellence and firm performance. The theoretical economics literature focuses on purely vertical differentiation and is mostly interested in how equilibrium prices and profits are affected by quality or firm reputation for quality; since quality might be difficult to observe prior to purchase, a common definition of reputation is the consumers' expectation of future quality based on the observation of past quality (Shapiro, 1983). Works predicting a price premium attached to reputation date back to the monopolistic setting of Klein and Leffler (1981) and the competitive one of Shapiro (1983). More recent contributions find mixed results concerning the impact of reputation on profits of competitive firms. For instance, Hörner (2002) and Fedele and Tedeschi (2014) consider Bertrand competition and find a positive effect; in a duopoly model where firms compete on quality and prices, Chambers et al. (2006) derive conditions under which the high-quality firm gets either higher or lower equilibrium profits than the low-quality firm, depending on the differential in market shares and variable costs.[2]

At the empirical level, the main focus is on the relationship between price and quality or reputation. While early works by Gerstner (1985) and Steenkamp (1988) use multi-sector data and find a weak link, subsequent studies confirm a positive and significant relationship in single sectors like wine (Combris et al., 1997; Crozet et al., 2011; Oczkowski, 2015; Castriota et al., 2021), movies (Reinstein and Snyder, 2005), retail shops (Sivadas et al., 2000), hotels (Ekinci et al., 2011; Becerra et al., 2013, who explicitly consider the effects both of vertical and horizontal differentiation), airlines (Han et al., 2019), and internet sales (Cabral and Hortaçsu, 2010; Jolivet et al., 2016; Fan et al., 2016).

However, the fact that product excellence has a positive effect on prices and, possibly, on profits does not necessarily imply higher profitability (Zahorik and Rust, 1992; Greising, 1994). How to make profitable investments in quality is a key managerial issue that has been discussed in the management literature since the 80s (for a review, see Zeithaml, 2000). An influential contribution is provided by Rust et al. (1995), who mention several examples of firms that tried to imitate successful quality-driven firms, but ended up realizing huge losses. To avoid this outcome, the authors propose a return on quality approach, according to which a company must be able to precisely estimate the return on investment of

[1] A striking example comes from Karle et al. (2020), who show that firms soften competition by choosing to join different e-commerce platforms, so that consumers are less likely to be informed about all products and offers.

[2] Liu and Zhang (2013) consider duopolistic dynamic pricing competition and show that higher quality reduces the negative impact on profits when consumers become more strategic.

its quality efforts, in order to know whether to spend and when to increase or reduce spending. It is, therefore, firm profitability measures accounting for the capital required to improve quality (such as the return on invested capital, ROIC, but also the return on equity, ROE, and the return on assets, ROA) that represent a highly effective way to evaluate whether investing in quality is a winning strategy.

To our knowledge, a theoretical and empirical analysis of how product excellence affects the profitability of firms operating in a competitive market with vertical and horizontal differentiation is lacking in the economics and management literatures. The present paper aims to fill this gap.

We develop a theoretical model of market competition, where the product supplied by firms differs in quality and variety. To keep the analysis as general as possibile, we allow for both types of competition that are believed to arise when products are differentiated, namely strategic price competition and monopolistic competition.[3] We show it is the interplay between vertical and horizontal differentiation that determines whether quality pays off in terms of profits, under both types of competition. Considering any two firms, a higher-quality firm turns out to be more likely to get larger equilibrium profits when its variety of the product is more "popular" than that supplied by the lower-quality competitor, i.e., it would be bought by the majority of consumers in the market, were prices and qualities of the two varieties kept equal. We then examine the effect of quality on firm profitability, defined as the ratio of firm equilibrium profits to the capital invested to implement and operate the production, and show it can be positive, zero, or negative, depending on the extra profits (if any) obtained by a higher-quality firm relative to the extra investment in quality.

We test our theoretical predictions using a unique panel dataset from three sources: the 2006-2015 balance sheets of 1,052 Italian firms involved in the production and bottling of wine, telephone surveys providing accurate information on the wineries' production activity, and wine guides. The wine sector nicely fits our theoretical framework because it is a highly competitive sector, due to a worldwide stagnant consumption pattern and structural excess supply (Castriota, 2020, ch. 1), and because wine typically differs in quality and variety. Since balance sheet data are at the firm-year level and each winery, in most cases, produces wines of different (variety and) quality, we use the scores awarded by influential wine guides to wineries' reputation to proxy the average quality of their products. Applying different econometric methodologies to this extensive dataset, we find that reputation has a positive impact on profits, but no significant impact on profitability, as measured by ROIC. We interpret this finding as evidence that the larger profits are not enough to compensate for the larger initial investments to produce high quality. Such investments may require to buy land in prestigious wine regions, where the price per hectare can be extremely high and the yield per hectare must be limited, and to use costly modern vinification machines.

A possible drawback of using ROIC to measure profitability is related to the so-called life-cycle theory of dividends, according to which successful firms reinvest profits, rather than distribute them, to expand their production activity (for empirical support, see, e.g., Benartzi et al., 1997, and Grullon et al., 2002). This is often observed in dynamic industries, like high-tech, where the distribution of dividends can even

[3] Strategic competition can fit the competitive behavior of young firms, which may need to consider the price as a strategic tool to gain market share over competitors; monopolistic competition can instead be representative of firms with an established brand that can set the price giving less consideration to strategic interaction.

signal that growth came to an end.[4] When this is the case, relatively small ROIC are observed in highly profitable firms because the profit growth is neutralized by an almost equivalent increase in the invested capital. Suppose then higher-quality wineries in our sample are actually more profitable, but display the same average ROIC as lower-quality wineries simply because they reinvest profits. This would invalidate our empirical conclusion that quality does not pay off. However, Italian wineries are unlikely to reinvest profits to acquire additional land due to strict EU regulations on planting rights.[5]

Related theoretical literature. Strategic competition with vertical and horizontal differentiation has been explored, in most cases, using variants of the Hotelling duopoly framework. Gabszewicz and Thisse (1986) and Lambertini (1997) model vertical differentiation by locating firms outside of the Hotelling unit length interval; in Dos Santos Ferreira and Thisse (1996), vertical differentiation is due to asymmetric transportation costs; in Neven and Thisse (1990), it is inserted in a two-dimensional setup; Gabszewicz and Wauthy (2012) consider an asymmetric distribution of tastes across consumers; Deltas et al. (2013) assume that the gross utility consumers get from the consumption of a product differ between firms, which is the approach we follow in this paper, and examine firms' strategic incentives to invest in the degree of product greenness.[6] Zeithammer and Thomadsen (2013) study price and quality competition in a horizontally and vertically differentiated duopoly, where consumers are allowed to buy more than one unit of the product, therefore departing from Hotelling. The assumption of unit demand is relaxed in Di Comite et al. (2014) too, which, to the best of our knowledge, is the only work examining monopolistic competition in presence of vertical and horizontal differentiation; the authors explore the role of product quality and variety in affecting firm ability to export. We rely on their framework to model monopolistic competition in this paper.

We contribute to this literature by exploring how the interplay between vertical and horizontal differentiation affects the relationship between quality and profitability.

Related empirical literature. The empirical literature exploring the impact of product excellence on firm profitability has developed mainly in the field of management and has found mixed results (for an early review, see de la Fuente Sabate and de Quevedo Puente, 2003). A first group of papers use multi-industry data (e.g., Phillips et al., 1983; Roberts and Dowling, 2002). This is positive in terms of sample size, but might come with a cost of misspecified variables because appropriate measures of excellence and profitability can be sector-specific (de la Fuente Sabate and de Quevedo Puente, 2003). On top of that, excellence is often measured using composite indexes of corporate reputation, like the Fortune one; these indexes capture product quality, but also aspects that have no direct link to quality (e.g., community and environmental friendliness, ability to develop and keep key people, degree of innovativeness, and management quality), or are themselves proxies for financial health (e.g., financial soundness).

A second group of papers avoid the above criticalities by focusing on single sectors. Rose (1990) finds a negative correlation between accident rates and airlines' profitability and Nelson et al. (1992) observe that patients' rating of private hospitals' quality is positively associated with ROA. Such findings might

[4] Notorious examples include Microsoft and Apple that decided to distribute profits only after the initial booming growth.

[5] Firms willing to expand their production scale cannot simply plant commercial vineyards on any piece of land; rather, they must get additional planting rights from the EU or buy them from other firms (Castriota, 2020, ch. 8).

[6] There is a growing theoretical literature in environmental economics making use of frameworks with bidimensional differentiation (e.g., Mantovani et al., 2016).

be influenced by the peculiar role played by quality in these sectors, where customers' health, rather than utility, is at stake. Deephouse (1997) focuses on commercial banks, but his measure of reputation, namely capital sustainability ratios, is a proxy for financial performance. More recently, the dramatic growth of the e-commerce has enabled researchers to use more precise proxies for quality, such as firm online reputation based on consumer feedback. Anagnostopoulou et al. (2020) consider the hotel sector and find a positive link between hotels' online reputation and ROA. To our knowledge, no analyses have been carried out in the wine sector, where wine guides have assumed the function of rating agencies due to relevant asymmetric information (Hay, 2010), and whose evaluations can accordingly be considered an appropriate and unbiased measure of quality.

The remainder of the paper is structured as follows. Section 2 develops the theoretical framework. Section 3 examines the empirical impact of reputation on firm profitability. Section 4 concludes by discussing other industries which our empirical findings may be applied to, along with policy and managerial implications. The Appendix contains mathematical proofs of the theoretical results and the empirical analysis of the relation between reputation and firm profits.

2 Theoretical Model

We consider a competitive market in which the product supplied by firms exogenously differ in quality and variety. We examine two alternative types of competition, strategic and monopolistic competition. The timing of the model is as follows. Before competition takes place, firms invest a sunk fixed amount of capital to start up their production activity. Afterwards, firms compete, either strategically or monopolistically, by choosing prices in order to maximize profits. Finally, consumers make their purchase decisions and profits accrue. We begin our analysis with strategic competition, while monopolistic competition is examined in Section 2.2.

2.1 Strategic competition

In this section, we analyze a Hotelling model, where two firms differ in the variety and in the quality of the product supplied, and investigate strategic price competition.

Consumers. We consider a Hotelling segment of unit length and extremes 0 and 1, representing a continuum of varieties of a differentiated product. There are two firms, indexed by $i = L, H$. Each firm i produces a variety of the product and is located within the segment, firm L at any point $a \geq 0$ and firm H at any $1 - b \leq 1$, with $a \leq 1 - b$. Consumers of mass 1 have unit demand and are uniformly distributed along the segment. The location of each consumer denotes her/his ideal variety. In Figure 1, we provide a graphical representation of firms and consumers in this Hotelling segment.

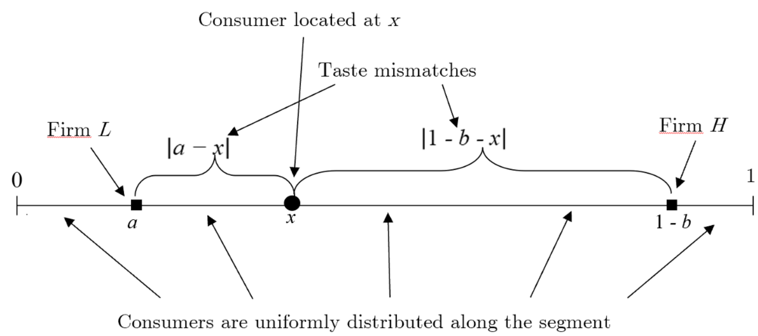
The net utility of a consumer located at point $x \in [0, 1]$ is given by

$$s_L - p_L - t\,(a - x)^2 \quad \text{when buying the product from firm } L, \tag{1}$$

$$s_H - p_H - t\,(1 - b - x)^2 \quad \text{when buying the product from firm } H, \tag{2}$$

where: (i) s_i is the gross utility consumers get from the consumption of the product supplied by firm i; we let $s_H > s_L$, indicating that consumers derive higher utility from the variety produced by firm H, or, equivalently, that this variety is of higher (observable or expected) quality;[7] (ii) p_i is the unit price charged by firm i; (iii) $t(a-x)^2$ or $t(1-b-x)^2$ denote the disutility of the consumer when buying from firm L or H due to a taste mismatch between the consumed variety, a or $1-b$, and her/his ideal variety, x; the taste mismatch is measured by the distances $|a-x|$ or $|1-b-x|$, while t is the marginal disutility of the distance.[8] Introducing both quality and taste in the consumer utility function nests vertical and horizontal differentiation in a unique framework. In the remainder of this section, we refer to s_i as the quality parameter.

FIGURE 1. THE HOTELLING SEGMENT



Solving equality (1) = (2) for x yields the location of the consumer obtaining the same net utility when purchasing the product from either firm (i.e., the indifferent consumer),

$$x_I = a + \frac{1-b-a}{2} + \frac{p_H - p_L - (s_H - s_L)}{2t(1-b-a)}. \tag{3}$$

We assume that s_i is relatively high, so that the indifferent consumer gets non-negative net utility in equilibrium when buying from either firm. This implies that all consumers are willing to buy. More precisely, those located left of x_I buy from firm L, x_I denoting therefore the demand of firm L; those located right of x_I buy from firm H, whose demand is $1-x_I$.

Expression (3) reveals that the demand faced by each firm $i = L, H$ is negatively affected by the own price p_i, while it is increasing both in the own quality parameter s_i and the competitor's price p_j, $j = H, L$. This last effect captures imperfect substitutability between the varieties supplied by firms L and H.

Firms. Each firm $i = L, H$ incurs constant marginal production costs c_i. We let $c_i < s_i$, otherwise no trade would occur between firms and consumers, and $c_H > c_L$ to denote the higher marginal cost of producing a higher-quality variety. Recalling that x_I in (3) and $1-x_I$ are the demand of firm L and firm H, the two firms' profit functions can be written as

$$\Pi_L = (p_L - c_L)\left[a + \frac{1-b-a}{2} + \frac{p_H - p_L - (s_H - s_L)}{2t(1-b-a)}\right] \tag{4}$$

and

$$\Pi_H = (p_H - c_H)\left[b + \frac{1-b-a}{2} - \frac{p_H - p_L - (s_H - s_L)}{2t(1-b-S)}\right]. \tag{5}$$

[7] Without loss of generality, one could alternatively assume that firm L's variety is of higher quality.

[8] The taste disutilities are assumed to be quadratic in the distances because it is well known since d'Aspremont et al. (1979) that the price competition game might have no pure-strategy equilibria when firms can be located inside the segment and disutilities are linear.

Strategic interaction between firms lies in that the profit of each firm is affected by the price charged by the competitor via the demand function.

Equilibrium. We solve the Hotelling competition game, in which each firm i chooses price p_i simultaneously to maximize profit Π_i. The Nash equilibrium prices are as follows (see Appendix A.1 for calculations),

$$p_L^* = \frac{2c_L + c_H}{3} + t(1-b-a)\left(1 + \frac{a-b}{3}\right) - \frac{s_H - s_L}{3} \tag{6}$$

and

$$p_H^* = \frac{2c_H + c_L}{3} + t(1-b-a)\left(1 - \frac{a-b}{3}\right) + \frac{s_H - s_L}{3}. \tag{7}$$

Unsurprisingly, the equilibrium prices p_i^* are increasing both in the quality parameter s_i and the marginal cost c_i.

Next, we calculate the equilibrium profits by plugging p_L^* and p_H^* into (4) and (5),

$$\Pi_L^* = \frac{\{t(1-b-a)[3+(a-b)] - [(s_H - s_L) - (c_H - c_L)]\}^2}{18t(1-b-a)}, \tag{8}$$

$$\Pi_H^* = \frac{\{t(1-b-a)[3-(a-b)] + [(s_H - s_L) - (c_H - c_L)]\}^2}{18t(1-b-a)}. \tag{9}$$

We then derive the condition under which firm H gets higher equilibrium profits than firm L. To this aim, we posit the following

Assumption 1 $(s_H - s_L) - (c_H - c_L) > t(1-b-a)(a-b)$,

which ensures that inequality $\Pi_H^* > \Pi_L^*$ is fulfilled for *any* pair of varieties a and $1-b$, such that $0 \leq a \leq 1-b \leq 1$.

The left-hand side (LHS) of Assumption 1 captures vertical differentiation. An inspection of (8) and (9) reveals that the consumers' extra gross utility from the high-quality product, $s_H - s_L$, impacts positively on the equilibrium profits of the high-quality firm H and negatively on those of the low-quality firm L, while the opposite applies when it comes to the effect of the quality cost gap, $c_H - c_L$. This is why Assumption 1 requires $(s_H - s_L) - (c_H - c_L)$ to be relatively large for Π_H^* to be higher than Π_L^*. The right-hand side (RHS) of Assumption 1, instead, captures horizontal differentiation and is either positive when $a > b$, zero when $a = b$, or negative when $a < b$. For instance, when $a > b$ as in Figure 1, firm H is farther than firm L from the center of the Hotelling segment, meaning that the variety produced by firm H is less popular when it comes to taste, despite being of higher quality;[9] in other words, the quality level is negatively correlated with the variety popularity.[10] In this case, $t(1-b-a)(a-b)$ is positive and Assumption 1 requires a stricter condition than simply $(s_H - s_L) - (c_H - c_L) > 0$ for Π_H^* to be higher than Π_L^*. Overall, it is the interplay between vertical and horizontal differentiation that determines the profit gap, $\Pi_H^* - \Pi_L^*$.

We sum up our findings in the following

Lemma 1 (Strategic competition) *Under Assumption 1, the high-quality firm H earns higher profits than the low-quality firm L, for any pair of varieties supplied by the two firms.*

[9] Lower popularity means that firm H 's variety would be bought by less than 50% of consumers, were prices and qualities of the two varieties kept equal. To see this, one can plug $s_H = s_L$ and $p_H = p_L$ into (3), get $x_I = \frac{1+(a-b)}{2}$ and $1 - x_I = \frac{1-(a-b)}{2}$, and check that the latter value is less than $\frac{1}{2}$ if and only if $a > b$.

[10] Our framework is flexible enough to capture also no correlation when $a = b$, or positive correlation when $a < b$.

2.2 Monopolistic competition

In this section, we shift our attention from strategic to monopolistic competition. To this aim, we modify the previous model to account for a continuum of firms, rather than just two, each one exogenously differing in the variety and in the quality of the product supplied; we also relax the assumption of unit demand. As anticipated, this model is adapted from Di Comite et al. (2014).

Representative consumer. We consider a market with a representative consumer and two products, a differentiated product, supplied as a continuum of varieties indexed i and of mass one, and the numéraire. The consumer is characterized by the following quasi-linear utility function,

$$\int_0^1 (s_i q_i)\, di - \frac{1}{2}\int_0^1 \left(\beta_i q_i^2\right) di - \frac{\gamma}{2}\left(\int_0^1 q_i di\right)^2 + q_0, \tag{10}$$

where: (i) q_i denotes the quantity of variety i of the differentiated product; (ii) $s_i > 0$ indicates the consumer maximum willingness to pay for the first unit of variety i and is referred to as the (observable or expected) quality of variety i; (iii) $\beta_i > 0$ measures the taste mismatch between variety i and the consumer's ideal variety; (iv) $\gamma > 0$ denotes the degree of substitutability between any two varieties; (v) q_0 is the amount of the numéraire. Further details on the utility function (10) and, relying on a two-variety case, a detailed explanation of why parameters s_i and γ capture quality and substitutability are provided in Appendix A.2.[11] As in the previous section, introducing both quality s_i and taste β_i in the consumer utility function nests vertical and horizontal differentiation in a unique framework.

The consumer utility maximization problem is

$$\max_{q_i, q_0}\left[\int_0^1 (s_i q_i)\, di - \frac{1}{2}\int_0^1 \left(\beta_i q_i^2\right) di - \frac{\gamma}{2}\left(\int_0^1 q_i di\right)^2 + q_0\right] \tag{11}$$
$$\text{s.t.} \quad \int_0^1 (p_i q_i)\, di + q_0 = y,$$

where p_i is the unit price of variety i, the price of the numéraire is normalized to one, and y is the consumer income. In Appendix A.2, we solve this problem for any variety i and get the demand function

$$q_i = \frac{1}{\beta_i}\left(s_i - p_i - \gamma\frac{S-P}{2+\gamma B}\right). \tag{12}$$

where $S = \int_0^1 \left(\frac{s_i}{\beta_i}\right) di$, $P = \int_0^1 \left(\frac{p_i}{\beta_i}\right) di$, and $B = \int_0^1 \left(\frac{1}{\beta_i}\right) di$ are market aggregates denoting the quality index, the price index, and the mass of varieties; within these aggregates, each variety i is weighted by the inverse of its taste mismatch parameter, $\frac{1}{\beta_i}$. As in the strategic competition model - see expression (3) - the demand for variety i is negatively affected by the own price p_i, while it is increasing both in the own quality parameter s_i and the price index P, this last effect capturing imperfect substitutability among varieties.

Firms. We consider a continuum of firms, each one producing a variety of different quality. Firm producing variety i, referred to as firm i, incurs constant marginal production costs $c_i < s_i$ and chooses price p_i to maximize the profit function, $\Pi_i = (p_i - c_i)\, q_i$. Plugging q_i as in (12) into the profit function

[11] Instead, the interpretation of β_i as a taste parameter is explained after the equilibrium results are derived.

and solving the maximization problem for p_i yields

$$p_i = \frac{s_i + c_i}{2} - \gamma \frac{S - P}{2\,(2 + \gamma B)}. \tag{13}$$

This expression denotes the best response of any firm i to the market conditions, described by aggregates S, P, and B. Among other effects, p_i turns out to be increasing in the price index P because varieties are substitutes and, therefore, firm i can sell at a higher price when the other varieties become more expensive overall. A crucial difference with the strategic competition model lies in that the market share of any firm i is negligible. This implies, as is standard in monopolistic competition models, that the demand of firm i and, in turn, the optimal price p_i are not affected by the price charged by any single firm $j \neq i$ (i.e., no strategic interaction among firms), but only by the aggregate pricing behavior of all firms, captured by P.

Equilibrium. We calculate the equilibrium prices and profits. To this aim, we first derive the equilibrium price index, denoted by P^*, by integrating both sides of (13) over the mass of varieties and solving the resulting equation for P. We get

$$P^* = C + 2\frac{S - C}{4 + \gamma B},$$

where $C = \int_0^1 \left(\frac{c_i}{\beta_i}\right) di$ is the cost index. We then substitute this value into (13) and get the equilibrium price of variety i,

$$p_i^* = \frac{s_i + c_i}{2} - \gamma \frac{S - C}{2\,(4 + \gamma B)}. \tag{14}$$

As in the strategic competition model - see expressions (6) and (7) - the equilibrium price p_i^* is increasing both in the quality s_i and marginal cost c_i.

Finally, to calculate firm i equilibrium profits, we first substitute P^* and p_i^* into (12) and get the equilibrium quantity of variety i, denoted by q_i^*; then, we plug p_i^* and q_i^* into firm i profit function $\Pi_i = (p_i - c_i)\,q_i$,

$$\Pi_i^* = \frac{1}{\beta_i}\left(\frac{s_i - c_i}{2} - \gamma \frac{S - C}{2\,(4 + \gamma B)}\right)^2. \tag{15}$$

We are interested in deriving the condition under which a higher-quality firm $i = H$ gets higher equilibrium profits than a lower-quality firm $i = L$, that is, $\Pi_H^* > \Pi_L^*$ when $s_H > s_L$. To this aim, we posit the following

Assumption 2 $(s_H - s_L) - (c_H - c_L) > F\left(\beta_H, \beta_L\right),$

which ensures that inequality $\Pi_H^* > \Pi_L^*$ is fulfilled for any pair of taste parameters β_H and β_L.

An inspection of (15) reveals that the equilibrium profits are increasing in the quality level s_i and decreasing in the marginal cost c_i. This is why the LHS of Assumption 2, capturing vertical differentiation, must be relatively large for higher quality to result in higher profits. The RHS $F\left(\beta_H, \beta_L\right)$, whose formula is reported in Appendix A.2, is affected by the taste parameters β_H and β_L and captures horizontal differentiation. This term is either positive when $\beta_H > \beta_L$, zero when $\beta_H = \beta_L$, or negative when $\beta_H < \beta_L$. For instance, when $\beta_H > \beta_L$, variety H is less popular than variety L because the representative consumer would buy a lower quantity of variety H, were prices and qualities of both varieties kept equal.[12] In this case, the quality level is negatively correlated with the variety popularity and Assumption 2 requires a stricter condition than simply $(s_H - s_L) - (c_H - c_L) > 0$ for Π_H^* to be higher than Π_L^*. Again, the interplay between vertical and horizontal differentiation determines the profit gap, $\Pi_H^* - \Pi_L^*$.

A closer look at Assumption 2, along with Assumption 1, helps explain the spatial interpretation of parameter β_i. As discussed, the horizontal differentiation term in Assumption 1, $t(1-b-a)(a-b)$, is for instance, positive when $a > b$, that is, when the variety supplied by firm H is less popular than that of firm L. An equivalent scenario is captured by inequality $\beta_H > \beta_L$ in Assumption 2. This equivalence makes apparent that, just as parameters a or $1-b$ determine the taste mismatch between variety L or H and any consumer's ideal variety x in the Hotelling segment - in symbols, $|a-x|$ or $|1-b-x|$ -, parameter β_i does the same job between any variety i and the representative consumer's ideal variety in the monopolistic competition model, as long as the location of such ideal variety is normalized to zero for every i - in symbols, $|\beta_i - 0|$.

We sum up our findings in the following

Lemma 2 (Monopolistic competition) *Under Assumption 2, a higher-quality firm earns higher profits than a lower-quality firm, for any pair of varieties supplied by the two firms.*

2.3 Firm profitability

In this section, we conclude the theoretical analysis by asking the following question: under which conditions, a firm facing either strategic or monopolistic competition and producing higher quality turns out to be more, equally, or less profitable than a competitor supplying lower quality?

To provide a sensible answer, we first remind that each single firm i invested a (sunk) fixed amount of capital to start up the production activity; we denote this amount as K_i. Then, we introduce a profitability ratio, R_i, defined as the ratio of firm i equilibrium profits to the invested capital stock,

$$R_i = \frac{\Pi_i^*}{K_i},$$

where Π_i^* is given by (8) and (9) in the strategic competition model, and by (15) in the monopolistic competition one. Finally, we consider two firms $i = L, H$ supplying different quality levels, $s_H > s_L$, and compare their profitability ratios, after reasonably assuming that firm H invested more to set up the production of a higher quality product, $K_H > K_L > 0$. Solving inequalities $R_H \geq R_L$ and $R_H < R_L$ for the ratio of equilibrium profits, $\frac{\Pi_H^*}{\Pi_L^*}$, yields

$$\frac{\Pi_H^*}{\Pi_L^*} \geq \frac{K_H}{K_L} \text{ and } \frac{\Pi_H^*}{\Pi_L^*} < \frac{K_H}{K_L}, \tag{16}$$

respectively. We sum up our findings in the following

Proposition 1 (Profitability) *Under Assumptions 1 and 2, a higher-quality firm is*

(i) more profitable than a lower-quality firm when $\frac{\Pi_H^*}{\Pi_L^*} > \frac{K_H}{K_L}$,
(ii) equally profitable when $\frac{\Pi_H^*}{\Pi_L^*} = \frac{K_H}{K_L}$,

[12] Plugging $s_H = s_L$ and $p_H = p_L$ into (12), one can check that $q_H < q_L$ if and only if $\beta_H > \beta_L$.

(iii) less profitable when $\frac{\Pi_H^*}{\Pi_L^*} < \frac{K_H}{K_L}$,

for any pair of varieties supplied and any type of competition - strategic or monopolistic - faced by the two firms.

Since $\frac{K_H}{K_L} > 1$ by assumption, Proposition 1 states that the extra profits obtained by a higher-quality firm, $\frac{\Pi_H^*}{\Pi_L^*} > 1$, must be large relative to the extra investments, $\frac{K_H}{K_L}$, in order for quality to pay off in terms of profitability. When, instead, $\frac{\Pi_H^*}{\Pi_L^*}$ is equal to the cutoff ratio $\frac{K_H}{K_L}$, quality does not affect profitability. Finally, when $\frac{\Pi_H^*}{\Pi_L^*}$ is lower than the cutoff, quality turns out to have a negative impact.

3 Empirical Analysis

Our theoretical model derives the following predictions of how product quality may affect firm profitability, for any product variety supplied and type of competition - strategic or monopolistic - faced by firms: (i) under Assumptions 1 and 2, the effect of quality on profits is positive (Lemmas 1 and 2); (ii) the effect of quality on profitability can be positive, zero, or negative, depending on the comparison between the extra profits and the extra investments (Proposition 1). In this section, we provide an empirical analysis with the aim of testing Lemmas 1 and 2 and, especially, to identify a precise sign of the relationship between quality and profitability. We use data from the Italian wine market, where reliable information can be retrieved about the product quality supplied by firms, on one hand, and their profits and profitability, on the other hand.

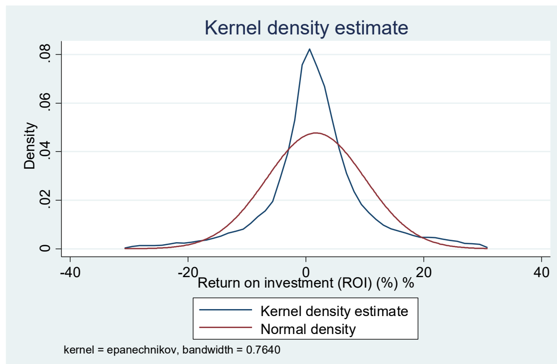
We create a unique dataset from three different sources. (i) The first source is AIDA (Analisi Informatizzata delle Aziende Italiane), which contains the Statement of Financial Positions and Income of over one million Italian companies. We use the balance sheet data of Italian firms producing wine in the period 2006-2015;[13] we identify the ROIC as the empirical measure of firm profitability, R_i in the theoretical model. (ii) The second source consists in telephone surveys. Since it is not uncommon that the ATECO codes classify firms into the wrong business or provide poor information about the exact nature of the business, we interviewed the firms' management to know whether any single company produced wine, wine grapes, table grapes, or it bottled other firms' wine. We dropped firms that are involved neither in wine production nor in bottling activities (e.g., firms that produce only table or wine grapes). Eventually, the sample contains 1,052 wineries. (iii) The third source consists in wine guides, which we rely upon to build a measure of product quality. As anticipated, our unit of observation is the individual winery which, in most cases, produces wines of different quality. We therefore need a synthetic measure for quality that considers all the wines produced by any single winery. Firm reputation for quality best fits our needs because it reflects the expectation of average future quality that will be supplied by a winery, based on the observation of average past quality. We collected information from the Italian Slow Food (SF) wine guide about firm reputation and from the international Hugh Johnson's (HJ) wine guide about firm and collective reputations; collective reputation stands for the reputation for quality of the best appellation in the province where wineries are located. We use these three indicators of reputation to proxy product quality.

[13] The selected ATECO 2007 (NACE Rev. 2) codes are 01.21.00 (cultivation of grapes), 11.02.00 (production of wine), 11.02.10 (production of table and quality v.q.p.r.d. wines), and 11.02.20 (production of sparkling and other special wines).

3.1 Summary statistics

Table 1 reports the description and summary statistics of the variables used in our analysis. In Italy, wine consumption has been falling for almost 50 years due to the combination of a stagnant demographic trend and a declining per capita pattern; this can explain why the average ROIC of sample wineries is only 2.60% and 33.4% of them report negative financial results. In Figure 2, we show that the distribution of firms' ROIC is symmetric around the mean and that most firms report either weakly positive or weakly negative returns; yet, the tails of the distribution are quite thick, showing a non-negligible proportion of firms reporting huge gains or losses.

Figure 2. Kernel density function of the firm ROIC



Profits of the sample wineries, measured by the Earnings Before Interest, Taxes, Depreciation, and Amortization (EBITDA), is 593,000 euros on average, while their average age is around 20 years and reaches a maximum of 104. The firm size, proxied by revenues in our preferred specification, is 6.19 million euros on average, while the maximum value is 252 million euros; as alternative measures of firm size, we also use total assets and number of employees to check the robustness of our analysis. We consider four business dummy variables to check whether wineries produce table and/or wine grapes on top of wine and whether they are just bottlers. The average ratio of debt over equity is 2.65% and 3.51 is the average number of owners of the sample wineries, with 50% run by at most two owners.

As for the three proxies for wine quality, *SF firm reputation* is a dummy variable awarded by the Slow Food guide to 2% of sample firms, while *HJ firm* and *collective reputations* are discrete variables ranging between 0 and 4, with 0.5 intervals, and are awarded by the Hugh Johnson's guide to 5.3% (firm reputation) and 87.1% (collective reputation) of sample firms. While SF is focused on Italy and judges wineries not only on the basis of product quality, but also on value for money and environmental sensitivity, HJ is among the most popular wine publications in the world and reviews production from all corners of the globe. We rely on *HJ firm reputation* as the main proxy for quality and use the other two measures as robustness checks.

Table 1 Here

The wine guide variables are lagged one year in that a guide published in year t is written in year $t-1$. This time gap turns out to be useful for our econometric analysis because it mitigates a potential reverse causality problem between reputation and profitability. As a further robustness test, we sometimes include the two HJ measures of reputation published in $t-1$, and therefore written in $t-2$.

3.2 Regression Analyses

The core of our empirical analysis consists in estimating the sign of the relationship between quality and profitability. Before doing so, we briefly test the predictions of Lemmas 1 and 2 on the relation between quality and profits. Table B1 in Appendix B reports a regression analysis that relies on limited-information quasi-maximum likelihood (QML) estimations of a linear dynamic random-effects model (Bhargava and Sargan, 1983) applied to the AIDA balance sheet data. QML estimations are particularly appropriate for panel data with many individual observations, but relatively short time horizon; this is the case in our analysis, characterized by more than 1,000 observations and a maximum time horizon of 10 years. The inclusion of the lagged value of the dependent variable, *L.EBITDA*, among the regressors is justified by the large literature showing persistence in profits (e.g., McGahan, 1999; Schumacher and Boland, 2005).

Results show that the auto-regressive component is indeed relevant and, most importantly, a positive relationship between both *HJ* and *SF firm reputations*, on one hand, and the EBITDA on the other hand, which confirms the predictions of Lemmas 1 and 2. Results are robust when we use the after-tax profits as the dependent variable and the total assets and the number of employees as proxies for firm size; these analyses are omitted for reasons of space, but available upon request.

Linear dynamic panel models with random effects. We start our analysis of the determinants of firm profitability with a linear dynamic panel model with random effects; in Table 2, we run the same model as that in Table B1, but using ROIC as the dependent variable. Individual effects can be treated as fixed or random and the choice between the two models is not straightforward. The difference in the estimates of parameters in case of a relatively large sample and limited time horizon can be significant. The random-effects model assumes non-observable firm characteristics to be uncorrelated with the regressors, otherwise inconsistent estimations are produced; the fixed-effects model is more appropriate if one believes non-observable firm characteristics to be instead correlated. In our analysis, random-effects are likely a better option because a deeper inspection of the *HJ firm reputation* standard deviation reveals that reputation differs more across firms (0.49) than within firms over time (0.17). Anyway, we will also run linear dynamic panel models with fixed effects to test the robustness of our findings.

Table 2 Here

Table 2 reveals that the age of wineries has a positive and significant effect on ROIC, which reflects the competitive disadvantage of young firms vis-à-vis well-established ones. The size of firms has a positive (and decreasing) effect as well; the reason might be that bigger firms organize the production activity more efficiently and are more likely to export.[14] By contrast, the presence of only one owner is negatively associated with ROIC.

Our main variables of interest are the three proxies for quality, *SF firm reputation, HJ firm and collective reputation* (and their lagged values), which do not display any economically significant and statistically robust coefficient. The use of total assets and number of employees as a proxy for firm size provides similar results (available upon request).

[14] This finding is in line with Sellers and Alampi-Sottini (2016) that consider a smaller panel of Italian wineries.

Interacting firm reputation and age. It is widely acknowledged it takes time for firms to improve quality (learning by doing), build a sales network, implement the marketing strategy, and make a name for themselves through repeated purchases and word-of-mouth. Information about firms' past performance diffuses gradually and markets need to observe the behavior of a new entrant for a while before the firm can build its reputation (e.g., Weigelt and Camerer, 1988). This explains why there can be a considerable delay between the time in which firms invest in quality and reputation and that in which they enjoy the benefits from this investment (e.g., Wilson, 1985). Such a delay is particularly likely in the wine sector where a vineyard needs 5-7 years to become productive and older vines yield better grapes. Castriota and Delmastro (2012; 2015) show that age is an important determinant of wineries' reputation; wineries may charge low prices and realize losses for several years before breaking even.

On the above basis, one could expect that the return on reputation are negative during the first years of activity and positive afterwards. In such a case, estimating a unique coefficient for firm reputation could be misleading because the initial negative effect on profitability and the subsequent positive one could cancel out. To check for this potential issue, we create a slope dummy variable to capture the potentially positive effect of older firms' reputation on profitability. The slope dummy variable is the product between the *HJ firm reputation* and a dummy variable equal to one if the firm age is above the median age of the sample. Results in Table 3 show there is no robust difference between firms above and below the sample median age. Older wineries either do not benefit in terms of profitability from better reputation. Results are very similar when we repeat the exercise with employees and total assets as proxies for firm size (available upon request).

Table 3 Here

Dynamic panel models with fixed-effects. As anticipated, we also consider fixed effects, which allow for arbitrary dependence between the observed regressors and the unobservable firm characteristics. In Table 4, we run the Arellano and Bond (1991) dynamic panel models with fixed effects and robust standard errors as an alternative specification. This implies we lose all the time invariant regressors. We run the basic model, which relies on the second lags of the dependent variable and all the feasible lags thereafter. Results confirm the persistence in profitability, the importance of firm size and, most importantly, that firm reputation plays no role in affecting firm profitability.[15] This robustness check provides additional evidence against any omitted variable endogeneity.

Table 4 Here

Propensity Score Matching. To better isolate the effect of reputation on ROIC from that of confounding elements and reduce the risk of reverse causality, in Table 5 we run Propensity Score Matching (PSM) regressions. We carry out a separate analysis for each year; this reduces the sample available in each estimation, but shows that results are highly stable across the whole time period. The analysis is divided into two steps.

[15] The Arellano-Bond tests for zero autocorrelation in first-differenced errors reject no autocorrelation of order 1 and cannot reject no autocorrelation of order 2 (available upon request).

In the first step, we calculate the propensity score, namely the probability that a winery has positive (i.e., at least 0.5) individual reputation in the Hugh Johnson guide, which is our treatment variable. For this purpose, we create a dummy variable equal to 1 if *HJ firm reputation* is strictly higher than 0. Following a standard practice in the literature, we use only those regressors that affect simultaneously the treatment and the outcome variables, that is, firm reputation and ROIC. In these regressions, the business dummy variable for bottlers has been dropped because it perfectly predicts failure; bottlers sell lower quality wines, therefore none of them has any reputation.

In the second step, we calculate the average treatment of the treated; this is a test for difference in mean between the ROIC of the treatment and that of the control sample, that is, firms with and without individual reputation but close propensity scores. More precisely, if two firms, given their characteristics such as size and age, exhibit close propensity scores, they have highly similar chances of receiving the treatment (i.e., positive *HJ firm reputation*); however, one received it and the other did not, like in a lottery. The second stage matching is performed with the Nearest Neighbor method - NNi, with $i = 1, 2, 3$ - according to which each treated firm is matched to $i = 1, 2, 3$ control firms with the closest propensity score(s); we also consider NN1 with bootstrapped standard errors (and 100 replications). Given the limited sample size, matching has been carried out with the replacement of previously selected firms. Results confirm that reputation is not a key factor for the profitability of wineries.

Table 5 Here

As a further robustness check (available upon request), we repeat the analysis of Table 2, but restrict the sample to the wineries with close propensity scores. More precisely, we match firms using the NN3 and NN5 methods based on 2010 and 2015 data and we proxy the firm size using not only revenues, but also employees and total assets. Results are robust in that both the autoregressive component and the firm size play a role, while the three proxies for reputation do not show any significant effect on profitability.

Cross-section on firm-average annually-demeaned ROIC. Our final exercise consists in transforming the panel dataset into a cross-section. This seems to be a useful exercise, given that most variability in terms of reputation comes from the comparison across wineries, rather than the variation over time within wineries.

First, we demean the annual ROIC of each winery by subtracting the average ROIC of all firms in that specific year. Then, we collapse the dataset by calculating the firm-average annually-demeaned ROIC and the firm-average regressors. The resulting cross-sectional regressions, reported in Table 6, confirm the importance of firm age, size, and number of owners, while the estimated parameters on HJ firm and collective reputations are again not significantly different from zero.

Table 6 Here

Overall, our empirical analysis provides robust evidence that firm reputation for quality does not impact on the ROIC of sample wineries. Selling mediocre wines might not be something to be proud of; notwithstanding, our analysis suggests it is equally profitable. Since quality generally requires large investments by wineries, the theoretical model suggests that reputation has no effect on profitability, in spite of the positive impact on profits, when the higher profits are not enough to compensate for the higher investments, as described by equality (ii) in Proposition 1. In turn, the estimated positive effect on profits occurs when either Assumption 1 (in case of strategic competition) or 2 (in case of monopolistic competition) are fulfilled. This theoretical prediction has two nice features.

(i) It is robust to both types of competition because the two assumptions require the same condition to hold true.[16] Such robustness allows us to neglect that, in spite of knowing the Italian wine sector is a competitive one, it is not apparent which of the two competitions is prevalent among sample wineries.

(ii) It encompasses positive, zero, and negative correlation between quality level and variety popularity (see, e.g., Footnote 10). Such generality turns out to be useful because any individual winery - our unit of observation - is likely to produce different varietes of wine, which we cannot observe (apart from poorly informative regional dummy variables). As a consequence, we ignore whether the sample wineries with better reputation produce either more, equally, or less popular varieties than those with worse reputation. If they produced less or equally popular varieties, the model predicts that the estimated positive impact of reputation on profits is necessarily driven by higher quality being particularly valued by consumers relative to its higher costs (vertical differentiation matters).[17] If, by contrast, sample wineries with better reputation produced more popular varieties, the positive impact on profits could (also) be due to the higher popularity of the varieties supplied by higher-quality firms (horizontal differentiation could also matter).[18]

4 Conclusions

Is it worth striving for excellence? Winemakers can hire famous consultants to improve product quality and build reputation; fashion designers can use expensive textiles and decorations to supply luxury clothes; chefs can invest huge amounts of money for the interior design of restaurants and the raw materials necessary to produce unforgettable dishes. A rationale behind these efforts is that clients will increase their willingness to pay, which, in turn, will impact positively on price, profits and profitability. While the expectation on price is correct, as widely documented in the literature, that on profits and, especially, profitability is not necessarily so, as highlighted by our analysis.

In this paper, we derived and spelled out the theoretical conditions under which the effect of quality on firm profitability can be either positive, zero, or negative. We then tested the theory using data from the Italian wine industry and found that reputation, defined as the expectation of future quality based on the past quality observed by the authors of two influential wine guides, has no effect on profitability. This empirical result can in principle be extended to other industries where both vertical and horizontal differentiation strategies are commonly observed. One can think of tourism (hotels, ski or beach resorts, city destinations), food and restaurants, or clothing, among others. Kapferer and Tabatoni (2011), e.g., report that luxury brands (such as Louis Vuitton, Armani, and Ralph Lauren) do not display higher

[16] We remind that such condition consists in the vertical differentiation term on the LHSs of the assumptions, $(s_H - s_L) - (c_H - c_L)$, being higher than the horizontal differentiation term on the RHSs, either $t(1-b-a)(a-b)$ or $F(\beta_H, \beta_L)$.

[17] This is because the RHSs of Assumptions 1 and 2, $t(1-b-a)(a-b)$ and $F(\beta_H, \beta_L)$, would be non-negative in this case, meaning that the two assumptions are fulfilled when the LHS, $(s_H - s_L) - (c_H - c_L)$, is high enough.

[18] This is because the RHSs would be negative in this case, meaning that the two assumptions could also be fulfilled when these values are low enough.

profitability, measured by return on sales (ROS), than non-luxury brands.[19]

Policy implications. Most wineries in Europe have tiny market shares, as opposed to competitors in extra-European countries (Castriota, 2020, ch. 1). Yet, our empirical results suggest firm size, rather than excellence, to be a key to profitability, likely because of the positive impact on production efficiency and ability to export; the latter is of paramount importance in the European wine sector, characterized by falling domestic consumption and high competition in the export market. Competition authorities could rely on this evidence and consider the idea of supporting mergers & acquisitions policies to enhance the average size of firms. Producer surplus would benefit, with likely no effects or even positive ones on consumer surplus, due to the interplay between possible efficiency gains and pre-merger poorly concentrated markets.

Managerial implications. It is well-known that managerial compensation packages are partly based on firm performance, as measured by profits. Conversely, firm owners are likely to be willing to make the best use of their money and, accordingly, to target the return on their investments, rather than the profit growth. If there is separation of ownership and control, our results then suggest that incentives of managers and owners may be misaligned: managers are induced to (over)invest in quality because of the positive impact on firm profits and, in turn, on their remuneration; this, however, does not result in better use of the owners' money because ROIC is not affected. The resulting managerial implication is that executive compensation packages could be made contingent not only on profits, but also on profitability ratios, such as ROIC. This would help align the managerial incentives to invest in quality with the owners' goal of targeting profitability.[20]

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[19] Anecdotal evidence in the restaurant sector points to the same direction. Over the last years, well-reputed chefs, like Sébastien Bras in France and Julio Biosca in Spain, chose to return their Michelin stars and asked not to be rated anymore by the guide. These surprising decisions are generally driven by the fact that fullling clients' expectations is too stressful and expensive. Similarly, a growing number of chefs build their reputation thanks to starred restaurants, but make profits out of low-cost spinoffs (https://it.businessinsider.com/in-italia-e-boom-dei-bistrot-stellati-ecco-perche-cannavacciuolo-e-gli-altri-top-chef-aprono-ristoranti-low-cost/), or become private chefs for the very rich (https://www.businessinsider.com/personal-michelin-starred-chefs-new-it-item-ultra-wealthy-people2020-10?IR=T).

[20] Alternatively, one can think of owners that care for prestige, rather than profitability, in which case undertaking quality investments with no impact on ROIC would not necessarily imply a conflict of interests between owners and managers.

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A Appendix: Theoretical Model

A.1 Strategic competition

Equilibrium prices. Differentiating Π_L wrt p_L and Π_H wrt p_H yields the FOCs

$$\frac{1+c_L+p_H-2p_L-(s_H-s_L)-\left(a^2-b^2+2b\right)}{2\left(1-b-a\right)}=0$$

and

$$\frac{1+c_H+p_L-2p_H+(s_H-s_L)+\left(a^2-b^2-2a\right)}{2\left(1-b-a\right)}=0.$$

One can easily check that the second order conditions are fulfilled. Solving the system of the two FOCs for p_L and p_H yields (6) and (7).

A.2 Monopolistic competition

Utility function (10). We illustrate the derivation of the consumer utility function by starting from a two-variety case. Accordingly, we rewrite (10) as

$$\sum_{i=1}^{2} s_i q_i - \frac{1}{2}\sum_{i=1}^{2}\beta_i q_i^2 - \frac{\gamma}{2}\sum_{i=1}^{2}\sum_{j\neq i} q_i q_j + q_0. \tag{17}$$

Expanding the two summations of the third term yields $2q_1q_2$. If $q_i \to 0$, $2q_1q_2$ can be approximated to $(q_1+q_2)^2$. Plugging this value into (17) yields

$$\sum_{i=1}^{2} s_i q_i - \frac{1}{2}\sum_{i=1}^{2}\beta_i q_i^2 - \frac{\gamma}{2}\left(\sum_{i=1}^{2} q_i\right)^2 + q_0. \tag{18}$$

When moving from two to a continuum of varieties of mass 1, the quantity q_i of each variety becomes indeed negligible, $q_i \to 0$. We can therefore integrate (18) over the continuum of varieties and get (10).

Interpretation of parameters s_i and γ. We use a two-variety case to illustrate the role played by (i) s_i and (ii) γ.

(i) The consumer utility maximization problem can be written as

$$\max_{q_i, q_0} \left(\sum_{i=1}^{2} s_i q_i - \frac{1}{2} \sum_{i=1}^{2} \beta_i q_i^2 - \frac{\gamma}{2} \sum_{i=1}^{2} \sum_{j \neq i} q_i q_j + q_0 \right)$$
$$\text{s.t. } \sum_{i=1}^{2} p_i q_i + q_0 = y,$$

where p_i is the unit price of variety i, the price of the numéraire is normalized to one, and y is the consumer income. Solving this problem yields the inverse demand function for variety $i = 1, 2$,

$$p_i = s_i - \beta_i q_i - \frac{\gamma}{2} q_j. \tag{19}$$

This expression shows that parameter s_i indicates the consumer maximum willingness to pay for the first unit of variety i. If, say, $s_1 > s_2$, variety 1 is of higher quality than variety 2. This definition of quality is adapted from that provided in Section 2.1 and takes into account there is a representative consumer who is not anymore bounded to buy at most one unit of the product.

(ii) We solve (19) for q_1 and q_2 and get the demand functions for the two varieties

$$q_1 = \tfrac{s_1 - p_1}{\beta_1} - \tfrac{\gamma}{2} \tfrac{q_2}{\beta_1},$$
$$q_2 = \tfrac{s_2 - p_2}{\beta_2} - \tfrac{\gamma}{2} \tfrac{q_1}{\beta_2},$$

which show that parameter $\gamma > 0$ measures the degree of substitutability between the varieties. Indeed, if p_1 (p_2) rises, q_1 (q_2) decreases; this, in turn, increases q_2 (q_1) as long as $\gamma > 0$, meaning that the two varietes are imperfect substitutes.

Consumer utility maximization problem. We focus on any variety i and rewrite the utility function after substituting the budget constraint, $q_0 = y - p_i q_i$,

$$s_i q_i - \frac{1}{2} \beta_i q_i^2 - \frac{\gamma}{2} q_i Q + y - p_i q_i$$

where $Q = \int_0^1 q_i di$ denotes the total quantity of the differentiated product. We calculate the FOC and solve it for q_i to get the demand function for variety i

$$q_i = \frac{s_i - p_i - \frac{\gamma}{2} Q}{\beta_i}. \tag{20}$$

We then compute Q by integrating both sides of (20) over the mass of varieties,

$$Q = \int_0^1 \left(\frac{s_i - p_i - \frac{\gamma}{2} Q}{\beta_i} \right) di,$$

and solve for Q to get

$$Q = \frac{2(S - P)}{2 + \gamma B}, \tag{21}$$

Finally, plugging (21) into (20) yields (12).

Calculation of $F(\beta_H, \beta_L)$. We solve inequality

$$\Pi_H^* = \frac{1}{\beta_H}\left(\frac{s_H - c_H}{2} - \gamma\frac{S-C}{2(4+\gamma B)}\right)^2 > \Pi_L^* = \frac{1}{\beta_L}\left(\frac{s_L - c_L}{2} - \gamma\frac{S-C}{2(4+\gamma B)}\right)^2$$

for $(s_H - s_L)$ after letting $c_H > c_L$. We also let $\Omega = \gamma\frac{S-C}{4+\gamma B}$ and $\omega = \left(\frac{\beta_H}{\beta_L}\right)^{\frac{1}{2}}$ so that the above inequality can be rearranged as

$$s_H - s_L > c_H - c_L + (\omega - 1)(s_L - c_L - \Omega),$$

where $(\omega-1)(s_L - c_L - \Omega)$ is denoted as $F(\beta_H, \beta_L)$ in the text. Note that $s_L - c_L - \Omega > 0$, otherwise the equilibrium quantity $q_L^* = \frac{1}{2\beta_L}\left(s_L - c_L - \gamma\frac{S-C}{4+\gamma B}\right)$ would be negative, and $\omega > (<)\, 1$ if and only if $\beta_H > (<)\, \beta_L$, in which case $F(\beta_H, \beta_L)$ is positive (negative).

B Appendix: empirical test of Lemmas 1 and 2

Table B1 Here

Table 1: Description of the variables and summary statistics

Variable	Description	Obs	Mean	Std. Dev.	Min	Max
ROIC	Return of Invested Capital (%)	6,655	2.60	8.37	-29.95	29.99
EBITDA	EBITDA (1,000 €)	6,655	593	1,805	-5,073	21,267
Firm age	Firm age in years	6,655	19.53	16.68	0	104
Revenues (million €)	Revenues of the firm in million €	6,640	6.19	16.37	0	252
Employees	Number of employees	6,140	16.18	36.39	0	484
Total assets (million €)	Total assets in million €	6,655	11.53	26.22	0.001	414
Table grapes	DV=1 if the firm produces (also) table grapes	6,655	0.20	0.40	0	1
Wine grapes	DV=1 if the firm produces (also) wine grapes	6,655	0.74	0.44	0	1
Wine	DV=1 if the firm produces wine	6,655	0.96	0.19	0	1
Bottler	DV=1 if the firm is a bottler	6,655	0.04	0.19	0	1
Debt/equity ratio	Debt/Equity Ratio (%)	6,653	2.65	24.30	-979	500
Nr. of recorded owners	Nr. of recorded owners	6,655	3.51	6.02	1	109
1 owner	DV=1 if there is only one owner	6,655	0.18	0.39	0	1
2 owners	DV=1 if there are two owners	6,655	0.32	0.47	0	1
3+ owners	DV=1 if there are three or more owners	6,655	0.49	0.50	0	1
Slow Food: @	DV=1 if the firm is recognized by Slow Food as responsible and typical	6,655	0.01	0.11	0	1
Slow Food: €	DV=1 if the firm is recognized by Slow Food as good value for money	6,655	0.01	0.12	0	1
Slow Food: Firm reputation	DV=1 if the firm is recognized by Slow Food as a good wine producer	6,655	0.02	0.14	0	1
Hugh Johnson: Firm reputation	Number of stars awarded by Hugh Johnson as a good wine producer	6,655	0.14	0.60	0	4
Hugh Johnson: Collective reputation	Number of stars awarded by Hugh Johnson to the best appellation in the province	6,655	2.19	1.18	0	4

Table 2: Linear dynamic panel models with random effects

VARIABLES	(1) ROIC	(2) ROIC	(3) ROIC	(4) ROIC	(5) ROIC
L.ROIC	0.272***	0.272***	0.270***	0.270***	0.284***
	(0.0177)	(0.0177)	(0.0178)	(0.0178)	(0.0209)
Firm age	0.0434***	0.0431***	0.0506**	0.0342***	0.0289***
	(0.0110)	(0.0111)	(0.0248)	(0.0110)	(0.0103)
Firm age_2			-0.000287		
			(0.000351)		
Revenues (million €)	0.0629***	0.0620***	0.135***	0.136***	0.144***
	(0.0101)	(0.0101)	(0.0180)	(0.0179)	(0.0174)
Revenues (million €)_2			-5.27e-10***	-5.33e-10***	-6.16e-10***
			(1.06e-10)	(1.05e-10)	(1.06e-10)
Debt/equity ratio	0.00660	0.00662	0.00674	0.00670	0.00369
	(0.00429)	(0.00429)	(0.00429)	(0.00429)	(0.00410)
One owner	-2.255***	-2.164***	-2.120***	-2.018***	-1.552***
	(0.489)	(0.489)	(0.482)	(0.457)	(0.426)
Two owners	-0.410	-0.352	-0.235		
	(0.403)	(0.403)	(0.398)		
Slow Food: @	-2.361	-2.464	-2.631		
	(1.816)	(1.820)	(1.794)		
Slow Food: €	2.813**	2.723*	2.589*	2.676*	2.358*
	(1.406)	(1.408)	(1.387)	(1.387)	(1.358)
Slow Food: Firm reputation	1.771				
	(1.425)				
Hugh Johnson: Firm reputation		0.173	0.0439	0.0353	
		(0.234)	(0.233)	(0.232)	
Hugh Johnson: Collective reputation	-0.171	-0.173	-0.134	-0.155	
	(0.196)	(0.197)	(0.194)	(0.193)	
Hugh Johnson: Firm reputation (t-1)					0.0136
					(0.236)
Hugh Johnson: Collective reputation (t-1)					-0.0585
					(0.182)
Constant	3.637	3.713	3.379	3.544	1.332
	(2.757)	(2.760)	(2.723)	(2.720)	(2.594)
Observations	4,783	4,783	4,783	4,783	4,473

Notes: Standard errors in parentheses. Regressions include Year, Regional and Business Dummy Variables. Regressions rely on limited-information quasi-maximum likelihood (QML) estimations of dynamic random-effects models (Bhargava and Sargan, 1983)

*** p<0.01, ** p<0.05, * p<0.1

Table 3: Linear dynamic panel models with random effects, with slope DV for older firms with reputation

VARIABLES	(1) ROI	(2) ROI	(3) ROI	(4) ROI	(5) ROI
L.ROIC	0.272***	0.272***	0.270***	0.270***	0.284***
	(0.0177)	(0.0178)	(0.0178)	(0.0178)	(0.0209)
Firm age	0.0434***	0.0434***	0.0505**	0.0343***	0.0290***
	(0.0110)	(0.0112)	(0.0248)	(0.0112)	(0.0105)
Firm age_2			-0.000287		
			(0.000352)		
Revenues (million €)	0.0629***	0.0619***	0.135***	0.136***	0.144***
	(0.0101)	(0.0101)	(0.0180)	(0.0180)	(0.0174)
Revenues (million €)_2			-5.27e-10***	-5.32e-10***	-6.16e-10***
			(1.06e-10)	(1.06e-10)	(1.06e-10)
Debt/equity ratio	0.00660	0.00662	0.00674	0.00670	0.00369
	(0.00429)	(0.00429)	(0.00429)	(0.00429)	(0.00410)
One owner	-2.255***	-2.160***	-2.119***	-2.016***	-1.552***
	(0.489)	(0.489)	(0.482)	(0.457)	(0.426)
Two owners	-0.410	-0.349	-0.235		
	(0.403)	(0.403)	(0.399)		
SF: @	-2.361	-2.454	-2.632		
	(1.816)	(1.820)	(1.794)		
SF: €	2.813**	2.723*	2.574*	2.669*	2.358*
	(1.406)	(1.409)	(1.389)	(1.388)	(1.360)
SF: Firm reputation	1.771				
	(1.425)				
HJ: Firm reputation		0.202	0.0420	0.0475	
		(0.264)	(0.264)	(0.263)	
HJ: Firm reputation_slope		-0.0747	0.00586	-0.0306	
		(0.319)	(0.318)	(0.317)	
HJ: Collective reputation	-0.171	-0.173	-0.133	-0.154	
	(0.196)	(0.197)	(0.194)	(0.193)	
L.HJ: Firm reputation					0.0190
					(0.274)
L.HJ: Firm reputation_slope					-0.0125
					(0.346)
L.Collective_reputation					-0.0585
					(0.182)
Constant	3.637	3.707	3.377	3.540	1.331
	(2.757)	(2.758)	(2.723)	(2.720)	(2.594)
Observations	4,783	4,783	4,783	4,783	4,473

Notes: Standard errors in parentheses. Regressions include Year, Regional and Business Dummy Variables. Regressions rely on limited-information quasi-maximum likelihood (QML) estimations of dynamic random-effects models (Bhargava and Sargan, 1983)

*** p<0.01, ** p<0.05, * p<0.1

Table 4: Arellano-Bond Dynamic Panel with Fixed Effects

VARIABLES	(1) ROI	(2) ROI
L.ROIC	0.317***	0.345***
	(0.0417)	(0.0407)
Firm age	-0.154	
	(0.116)	
Firm age_2	-0.000680	
	(0.00180)	
Revenues (million €)	0.330***	0.288***
	(0.0941)	(0.0767)
Revenues (million €)_2	-1.02e-09***	-9.32e-10***
	(3.58e-10)	(3.42e-10)
Debt/equity ratio	0.00751	
	(0.00867)	
HJ: Firm reputation	0.321	0.388
	(0.664)	(0.659)
Constant	3.420**	-0.0770
	(1.483)	(0.480)
Observations	4,178	4,178

Note: Data refer to the period 2006-2015. Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Arellano-Bond test for zero autocorrelation in first-differenced errors		
Oreder 1	-9.4668***	-9.8171***
	(0.000)	(0.000)
Order 2	.92033	1.065
	(0.357)	(0.286)

Note: Prob > z in parethesis
*** p<0.01, ** p<0.05, * p<0.1

Table 5: Propensity score matching, by year

Year	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Step 1: Propensity score (dep. var. is a DV=1 if Hugh Johnson: Firm Reputation > 0)										
Firm age	0.0208***	0.0229***	0.0219***	0.0225***	0.0222***	0.0210***	0.0197***	0.0190***	0.0171***	0.0144***
	(0.00584)	(0.00595)	(0.00589)	(0.00583)	(0.00580)	(0.00533)	(0.00504)	(0.00490)	(0.00474)	(0.00440)
Revenues (million €)	0.0608***	0.0778***	0.0849***	0.0797***	0.0625***	0.0565***	0.0526***	0.0442***	0.0439***	0.0369***
	(0.0152)	(0.0163)	(0.0172)	(0.0179)	(0.0152)	(0.0125)	(0.0117)	(0.0104)	(0.0101)	(0.00901)
Revenues (million €)_2	-5.42e-10**	-7.04e-10***	-8.70e-10***	-7.45e-10**	-5.40e-10**	-4.58e-10***	-4.05e-10***	-3.08e-10***	-2.96e-10***	-2.10e-10**
	(2.34e-10)	(2.64e-10)	(2.74e-10)	(3.11e-10)	(2.22e-10)	(1.60e-10)	(1.35e-10)	(1.09e-10)	(1.03e-10)	(8.76e-11)
Wine grapes	-0.417	-0.432	-0.433	-0.453	-0.503*	-0.387	-0.422*	-0.345	-0.396*	-0.293
	(0.271)	(0.289)	(0.289)	(0.288)	(0.270)	(0.255)	(0.254)	(0.246)	(0.235)	(0.223)
One owner	-0.816**	-1.548***	-1.414***	-1.453***	-0.852**	-0.826**	-0.802**	-0.794**	-0.821**	-0.759**
	(0.327)	(0.459)	(0.439)	(0.460)	(0.362)	(0.345)	(0.341)	(0.337)	(0.340)	(0.328)
Two owners	-0.465*	-0.615**	-0.588**	-0.644**	-0.307	-0.247	-0.269	-0.336	-0.275	-0.188
	(0.265)	(0.286)	(0.282)	(0.294)	(0.269)	(0.241)	(0.237)	(0.232)	(0.217)	(0.197)
Slow Food: @	0.669	0.535	0.791	0.605	0.953	0.665	0.690	0.758	0.660	1.019**
	(0.677)	(0.640)	(0.684)	(0.638)	(0.676)	(0.608)	(0.608)	(0.620)	(0.627)	(0.496)
Slow Food: €	1.958***	1.874***	1.775***	1.556***	0.990*	0.937*	0.969*	0.843*	0.732	0.692
	(0.627)	(0.554)	(0.519)	(0.603)	(0.530)	(0.518)	(0.514)	(0.497)	(0.483)	(0.466)
Hugh Johnson: Collective reputation	0.350***	0.337***	0.340***	0.306***	0.319***	0.335***	0.317***	0.337***	0.288***	0.183**
	(0.102)	(0.110)	(0.108)	(0.106)	(0.107)	(0.103)	(0.0993)	(0.0965)	(0.0914)	(0.0805)
_cons	-2.630***	-2.913***	-2.967***	-2.852***	-2.947***	-3.068***	-2.966***	-2.986***	-2.725***	-2.413***
	(0.427)	(0.432)	(0.433)	(0.427)	(0.419)	(0.398)	(0.379)	(0.371)	(0.333)	(0.296)
Step 2: ATT (dep. var. is ROIC)										
NN (1)	-0.57	-0.94	0.13	-1.76	0.49	1.31	-2.10	-1.66	-2-28	-1.03
	(2.24)	(2.16)	(-1.50)	(1.48)	(1.75)	(1.86)	(1.52)	(1.81)	(1.45)	(2.11)
NN (2)	0.37	-0.46	-0.75	-1.04	0.96	-0.07	-2.02	-0.90	-2.18*	-1.50
	(1.79)	(1.81)	(1.36)	(1.40)	(1.49)	(1.64)	(1.24)	(1.50)	(1.30)	(1.71)
NN(3)	0.25	-0.36	-0.28	-1.30	-0.33	-0.08	-1.96*	-1.48	-2-41*	-1.25

	(1.72)	(1.67)	(1.21)	(1.26)	(1.50)	(1.47)	(1.17)	(1.34)	(1.24)	(1.50)
NN (1) boothstrapped #100	-0.57	-0.94	0.13	-1.76	0.49	1.31	-2.10	-1.66	-2.28	-1.03
	(2.57)	(2.52)	(1.72)	(1.93)	(2.23)	(2.06)	(2.10)	(2.25)	(2.03)	(2.25)

Note: Robust standard errors in parentheses. For the second step, NN(1) boothstrapped report statistics with 100 replications
The dependent variable of the first step is a DV=1 if Hugh Johnson: Firm Reputation > 0, that of the second step is ROIC.
*** p<0.01, ** p<0.05, * p<0.1

Table 6: Regressions of average annually-demeaned values, by firm

VARIABLES	(1) ROIC	(2) ROIC
Firm age	0.0614***	0.0477***
	(0.0144)	(0.0140)
Revenues (million €)	0.0813***	0.220***
	(0.0232)	(0.0328)
Revenues (million €)_2		-1.21e-09***
		(2.85e-10)
Debt/equity ratio	-0.0114	-0.0107
	(0.0176)	(0.0176)
One owner	-2.790***	-2.630***
	(0.640)	(0.636)
Two owners	-0.405	-0.318
	(0.495)	(0.490)
SF: @	0.344	0.312
	(1.208)	(1.169)
SF: €	2.915**	2.877**
	(1.416)	(1.378)
HJ: Firm reputation	0.358	-0.00834
	(0.463)	(0.464)
HJ: Collective reputation	-0.352	-0.306
	(0.253)	(0.249)
Constant	1.389	1.252
	(2.460)	(2.487)
Observations	1,052	1,052
R-squared	0.169	0.186

Notes: Robust standard errors in parentheses. Regressions include DVs for the region and activity carried out
*** $p<0.01$, ** $p<0.05$, * $p<0.1$

Table B1: Linear dynamic panel models with random effects, EBITDA (1,000 €)

VARIABLES	(1) EBITDA	(2) EBITDA	(3) EBITDA	(4) EBITDA	(5) EBITDA
L.EBITDA	0.599***	0.610***	0.628***	0.629***	0.587***
	(0.0163)	(0.0168)	(0.0172)	(0.0172)	(0.0166)
Firm age	-1.872	-2.623**	-0.771	-3.109***	-3.634***
	(1.265)	(1.194)	(2.595)	(1.144)	(1.180)
Firm age_2			-0.0370		
			(0.0368)		
Revenues (million €)	41.01***	38.88***	42.13***	42.12***	48.46***
	(1.844)	(1.857)	(2.368)	(2.364)	(2.515)
Revenues (million €)_2			-3.60e-08***	-3.63e-08***	-6.38e-08***
			(1.10e-08)	(1.10e-08)	(1.13e-08)
Wine grapes	54.55	68.27	53.10	57.55	55.59
	(51.24)	(48.00)	(45.79)	(45.47)	(47.03)
Wine	116.5	69.81	73.40	73.44	96.87
	(109.9)	(102.9)	(97.54)	(97.23)	(100.4)
Bottler	-	-	-	-	-
Debt/equity ratio	0.203	0.225	0.234	0.227	-0.0979
	(0.455)	(0.456)	(0.456)	(0.456)	(0.413)
One owner	-57.25	-14.47	-6.555	-11.58	-18.47
	(55.94)	(52.38)	(49.65)	(47.00)	(48.50)
Two owners	-22.10	0.709	10.50		
	(46.59)	(43.55)	(41.39)		
Slow Food: @	7.201	-66.67	-72.59		
	(209.8)	(196.3)	(185.4)		
Slow Food: €	-22.65	-65.67	-69.37	-65.75	-12.91
	(163.2)	(152.5)	(144.1)	(143.9)	(158.1)
Slow Food: Firm reputation	357.0**				
	(166.5)				
Hugh Johnson: Firm reputation		163.3***	152.8***	152.5***	
		(24.57)	(23.91)	(23.83)	
Hugh Johnson: Collective reputation	21.13	11.77	11.21	10.59	
	(22.68)	(21.30)	(20.18)	(20.04)	
Hugh Johnson: Firm reputation (t-1)					163.9***
					(25.49)
Hugh Johnson: Collective reputation (t-1)					11.46
					(20.86)
Constant	-107.4	-60.16	-80.89	-65.52	-39.68
	(320.7)	(300.8)	(285.6)	(285.0)	(298.8)
Observations	4,783	4,783	4,783	4,783	4,473

Notes: Standard errors in parentheses. Regressions include Year, Regional and Business Dummy Variables. Regressions rely on limited-information quasi-maximum likelihood (QML) estimations of dynamic random-effects models (Bhargava and Sargan, 1983).

*** p<0.01, ** p<0.05, * p<0.1