Quality externalities in spatial competition: the case of sustainable tourism

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Abstract

This paper sheds light on the impact of market competition on quality choices by firms in a spatial framework (à la Salop). We extend a model previously used by Economides (1993) and Brekke et al. (2010, 2012) with two additional assumptions (that provide a good characterization of the tourism industry, among others): the presence of external effects in quality choices, and the (industry) circular city’s demand being endogenous to firm’s choices (price and quality). We show that, in such a framework, and contrary to some previous results (e.g. Economides, 1993), the impact of market competition on quality is a priori ambiguous and depends on the current level of market competition as well as on the price sensitivity of the industry’s demand. We also show that market quality will tend to be underprovided from a social point of view, and then discuss regulation, in particular the way in which entry restrictions, subsidies and market transparency affect firm’s quality choices.

Key words: quality, market competition, externalities, regulation, corporate social responsibility

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1 Introduction

The impact of market competition on the quality supplied by firms is, a priori, uncertain. On the one hand, more competition (i.e. more firms in the market) increases the incentive to supply quality (for given prices) in order to differentiate from rival firms; on the other hand, competition reduces prices (and margins) and, accordingly, decreases a firm’s incentive to invest in quality. Most empirical analysis of the relationship between quality and market competition in a spatial framework (where demand is affected by transportation costs) tend to show a positive correlation (see, among others, Liao and Chuang, 2004, on local fast food markets; Dranove et al., 1992, and Abraham et al., 2007, on the health care market; Mazzeo, 2003, on the airline industry; Fernandez and Santalo, 2010, on the relationship between market competition and corporate social responsibility, and Becerra et al., 2013, on the Spanish hotel industry).

Theory, however, when studying the impact of market competition on quality in a spatial framework such as, for instance, a model of competition à la Salop, has often derived a negative (or null) correlation. Thus, an increase in market competition in such a spatial framework (measured as an increase in the number of firms or a decrease in transport costs) has shown in most analysis a negative or null effect of such market competition on quality supplied by firms. The reason for such result are the lower incentives to invest in quality as a consequence of the reduction in price margins and market share caused by the increase in competition (see Economides, 1993, measuring competition with firm density and transport costs, while Ma and Burgess, 1993, obtain no net effect because of the exact cancelation of both opposite effects cited above, measuring market competition simply as a reduction in transport costs).

This negative (or null) theoretical effect of market competition on quality in a spatial framework, however, has been shown to be a result of the precise modelling of spatial and quality competition in the cited papers. Brekke et al. (2010) has shown that with more general assumptions on utility and costs, a positive causal relationship between market competition and quality choices by firms is obtained. More specifically, Brekke et al. (2010) assume: (i) the existence of income effects by assuming non-linear utility functions concave in the numeraire good, (ii) quality and output are assumed to be either complements or substitute; and (iii) two types of transportation costs, monetary and non-monetary.

In the current paper, we continue with the analysis of price and quality competition in a spatial framework incorporating some additional modeling characteristics that, to our opinion, characterize well the functioning of some important and significant industries such as, for
instance, tourism. Thus, in particular, we incorporate two additional assumptions to the more standard model of quality and spatial competition as exposed by Economides (1993), and extended by Brekke et al. (2010). On the one hand, we assume the presence of external effects in the quality investments undertaken by the firms located in the circular city. That is, a firm’s product quality does not only depend on its own quality investments but, rather, it is also affected by the other firms’ quality choices. On the other hand, the industry’s demand is assumed, as opposed to Economides (1993) and Brekke et al. (2010), to be endogenous (not exogenous) to firms’ choices such as prices and quality.

Our framework of spatial competition with these two additional assumptions (external effects of quality investments and endogenous industry’s demand) provide a good characterization of the tourism industry (among other industries, such as, for instance, the wine industry). First, in what concerns its spatial dimension; second, the presence of external effects with regards to some quality dimensions of tourism output such as, but not only, those related to the natural environment (and including aspects such as the landscape, beach and sea water quality, etc.); and third, competition in tourism takes place both within and between tourism destinations, the latter aspect captured by the circular city’s demand being endogenous to the industry’s quality and prices (Candela and Figini, 2012).

As we will show below, both modeling assumptions (quality external effects and endogenous demand) affect the way in which market competition impacts quality investments by firms in the circular city. On the one hand, the presence of external effects in firm’s quality investments generates an expected and intuitive underinvestment (free-riding) in quality by firms, leading to a quality under-provision from a social point of view (unless compensated by a large consumer consciousness). On the other hand, assuming a circular city’s endogenous demand drives the main result of the paper: namely, that the impact of market competition on firms’ quality choices is ambiguous. As a matter of fact, when measuring market competition with transport costs, we find that when demand is endogenous it is always the case that an increase in market competition increases firm’s quality choices. However, when market competition is measured by the number of firms in the city, its impact might go either way; in particular, only when the industry’s demand is very sensitive to prices and the current number of firms is small, an increase in market competition (the number of firms) increases the level of quality investment by firms. Intuition is as follows: competition causes a reduction in prices which increases overall city’s demand and firm’s market share and, therefore, it makes firm’s investment in quality more attractive.
Furthermore, we show that with endogenous demand, market quality is underprovided from a social point of view: price-taking firms in the industry do not (fully) take into account the way in which their quality investments influence industry’s demand and, correspondingly, industry’s profits and consumer surplus. Thus, the presence of external effects of quality, the endogeneity of industry’s demand, and the corresponding market inefficiencies provide a rationale for governmental regulation. We discuss the impact that regulation may have on the quality provided by the market, considering traditional forms of regulation (such as entry restrictions, taxes and subsidies and quality standards) as well as more modern mechanisms such as corporate social responsibility which the government might support through an increase in market transparency (Calveras and Ganuza, 2014).

The paper is organized as follows. In section 2 we present and solve the theoretical model, considering exogenous demand, while in section 3 we solve the model with endogenous demand. In section 4 we analyze social optimality of market quality, and discuss regulation. Section 5 discusses the close relationship between the paper’s analysis and the major issues surrounding the sustainability of a tourism destination, and then we conclude in section 6.

2 The model

An industry is represented by a circular city (Salop, 1979; Tirole, 1988) where, for the time being, the number of firms $n$ is considered to be exogenously given. The density of consumers (demand) around the circle is $d$, for the moment also exogenous, with consumers uniformly distributed around the circle. All $n$ firms are located symmetrically at the same distance around the circular city; thus, this means that the distance from one firm to another equals $1/n$. The capacity of each firm is assumed to be limitless, capable to satisfy any demand. Each firm, with the purpose to maximize its own profits, may invest (or not) in quality. More precisely, the timing is as follows:

**Stage 1**

With the purpose to maximize its own profits, each firm $i$ simultaneously invests in quality $q_i > 0$ and price $p_i$. It is assumed that quality comes at a cost $c(q_i) = c \cdot q_i^2/2$. Quality cannot take negative values. Firm investments determine the overall quality of the industry (region) $q_R$ (see

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2 In a previous version of the paper, we considered an alternative timing in which the firm first invested in quality and then determined the price, and the main results of the paper also hold. We keep as a benchmark the timing in which firms choose quality and price simultaneously because it is the timing in which previous papers such as Economides (1993) and Brekke et al. (2010) focused most of their analysis.
below). It is also assumed that the firms face no capacity constraints and have zero marginal costs of production.

**Stage 2**

As already mentioned, consumers are distributed uniformly along the city with a density $d$, for the moment assumed to be exogenous. The utility obtained by each consumer when going to firm $i$ from his or her current location $x$ is:

$$u(x,i) = r + v \cdot \hat{q}_i + \lambda \cdot q_i - (p_i + \tau(x,i)),$$

where $r$ stands for the utility that the tourist obtains from consuming any good, $p$ is the price paid, and $\tau(x,i)$ is the transport cost for consumer located at $x$ of going to firm $i$. Next, the role that quality and thus, quality externalities, play in the framework is detailed.

**Quality and external effects**

Quality enters the utility function of consumers in the following ways. $q_i$ is the intrinsic quality of firm $i$ (the amount the firm has invested in quality), whereas $\hat{q}_i$ is a compound (a weighted average) of the intrinsic quality of firm $i$ and of the overall quality of the circular city (or region), with $\hat{q}_i = \alpha \cdot q_R + (1 - \alpha) \cdot q_i$, with $0 \leq \alpha \leq 1$. The quality of the region is given by

$$q_R = \sum_{i=0}^{n} q_i / n.$$

Thus, the importance of external effects in quality (or, alternatively, the degree to which the quality in a destination has public good attributes) is given by two mechanisms. On the one hand, the number of firms in the circular city affects negatively the quality of the region: increasing $n$ (without any further investment) would thus reduce the quality of the region (one can imagine such an effect, for instance, through the consumption of natural or landscape resources that such a new firm entails; see for instance Calveras, 2003). On the other hand, the level of $\alpha$ also determines the degree to which external effects are present in the industry, with $\alpha = 1$ meaning that the quality is a pure public good resembling environmental quality (namely, the consumer only cares when buying a firm $i$’s good about the overall-average quality of the industry), and with $\alpha = 0$ the quality would not exhibit any public good attributes (when buying from firm $i$ the consumer only cares about the intrinsic quality of that firm $i$’s product).

Finally, $\lambda \geq 0$ represents the degree of ‘consciousness’ (or altruism) of consumers: to what extent they value quality supplied by a firm beyond their direct impact in utility, already captured by $v \cdot \hat{q}_i$, and thus the extent to which strategic corporate social responsibility (CSR)
may play a role a firm’s behavior. Another way to put it would be to consider that \( \lambda \) represents the consumer’s warm-glow from a willingness to pay for the quality external effects (social attributes) of the firm’s product (Andreoni, 1990, 2006; Calveras et al., 2009; Calveras and Gauza, 2014). It seems reasonable to assume that \( 0 \leq \lambda \leq \alpha \nu \); that is, that the warm-glow is no larger than the external effect such quality generates.

To summarize, a firm at stage 1 chooses simultaneously the price level and the quality that wants to offer. Afterwards, in stage 2, consumers, who are uniformly distributed among the firms, determine firm’s demand. Next, we solve the game by backward induction.

**Solving the game**

In stage 2, each consumer decides where to buy the good (with environmental quality, both at the regional and at the firm level, already determined), facing a dilemma between the two firms that are more closely located to him: in the circular city, only two firms compete for each customer. For a consumer placed at point \( x \), the utility he derives from going to firm A or B is, respectively:

\[
\begin{align*}
  u(x, A) &= r + v \cdot q_A + \lambda \cdot q_A - (p_A + \tau \cdot x), \\
  u(x, B) &= r + v \cdot q_B + \lambda \cdot q_B - (p_B + \tau (1/n - x)).
\end{align*}
\]

Demand is determined by the indifferent consumer who stands in between firms A and B at a point \( x^* \), where \( u(x^*, A) = u(x^*, B) \). It is obtained that

\[
x^* = \frac{\delta \cdot (q_A - q_B) - (p_A - p_B) + \frac{\tau}{B}}{2 \cdot \tau},
\]

with \( \delta \equiv v(1 - \alpha) + \lambda \). (Notice that, since \( \lambda \leq \alpha \nu \), this means that \( \delta \leq v \).) Obviously, given prices and quality, all consumers located nearer to firm A than \( x^* \) will choose it and all of the consumers that are closer to firm B will select it. That makes the demand each firm faces to correspond to the number of consumers that are placed on the left and right side of it. By symmetry, firm A’s demand is:

\[
D_A = 2 \cdot x^* \cdot d = d \cdot \frac{\delta (q_A - q_B) - (p_A - p_B) + \frac{\tau}{B}}{\tau}.
\]

Demand functions depend on density of consumers in the circular city, relative prices and relative quality, in addition to transport costs. (All along it is assumed that \( r \) is large enough so that all consumers purchase one good.)
In stage 1, given the demand function, a firm i sets its price and invests in quality. The profit function of each firm equals:

\[ \Pi_i = p_i \cdot D_i - c(q_i). \]

We obtain the firm A’s first-order conditions with respect to prices and quality:

\[ d \cdot \delta \cdot \left(q_A - q_B\right) - \left(p_A - p_B\right) + \frac{\tau}{n} - d \cdot \frac{p_A}{\tau} = 0, \]

\[ d \cdot \frac{p_A \cdot \delta}{\tau} - c \cdot q_A = 0. \]

Second order conditions are shown to be satisfied easily. In a symmetric equilibrium, all firms invest the same, namely, \( q_A = q_B = \ldots = q_i = q \), and \( p_A = p_B = \ldots = p_i = p \) which are substituted in the first order conditions. Then, quality and price in equilibrium are:

\[ p^E = \frac{\tau}{n}, \]

\[ q^E = \frac{d \cdot s}{n \cdot c}. \]

Partial derivatives can be computed in order to undertake some comparative statics (remember that \( \delta \equiv \nu(1 - \alpha) + \lambda \)). Then: \( \frac{dq}{da} = -\nu \frac{d}{cn} \leq 0, \frac{dq}{dn} = -\nu \frac{d}{cn^2} \leq 0, \frac{dq}{d\tau} = 0 \) and \( \frac{dq}{da} = \nu \frac{d}{cn} \geq 0 \). As a consequence, the first result of the paper follows:

**Result 1:** When an industry’s demand is exogenous, market competition measured by transport costs has no impact on market quality investments, while when measured by the number of firms, the impact is negative. Furthermore, the presence of external effects in quality reduces market quality while the consciousness (or altruism) by consumers increases firms’ quality investments.

Results are quite intuitive. The stronger external effects are, the stronger the free-riding effect and, thus, the lower the investment in equilibrium. Also, the stronger competition is (a larger number of firms \( n \)), the lower the incentives to invest in equilibrium (what matters for \( q \) is a firms’ market share \( \frac{d}{n} \) positively related to quality). However, when market competition is measured by transport costs (\( \tau \)) it has no impact on quality choices by firms. These results on
the effect of market competition in quality are the same ones as Economides (1993) obtains for \( n \) and \( \tau \) as measures of market competition, and those of Ma and Burgess (1993) with \( \tau \) as a measure of market competition (since they only assume two firms all along). Finally, the stronger is consumer consciousness, the more incentives firms have to invest in quality. Thus, when CSR plays a larger role in determining a firm’s investment (through a higher consumer’s consciousness), it happens that in equilibrium quality is larger. We show, thus, that the result in Economides (1993) holds as expected in a circular city in which demand is exogenous, and we also show that the presence of quality external effects further reduce firms’ investments.³

3 The model with endogenous demand

It is now assumed that an industry’s demand is endogenous, in particular that it depends linearly on both industry’s quality and prices. More specifically, the region’s demand \( D \) (and accordingly, since the city is of length 1, the region’s demand is the circular city’s density) is:

\[
D = d = A + a \cdot q_R - b \cdot p_R.
\]

It is assumed that firms behave as price-takers with respect to the destination’s demand. That is, when firms choose the levels of price and quality, they do not consider the effect of their choice on the overall circular city’s demand, only on the firm’s individual demand. Remember also that \( q_R = \sum_{i=0}^{n} q_i / n \). Then, keeping in mind that in equilibrium it must be that \( q_a = q_b = \ldots = q_i = q \), it is immediate that:

\[
d = A + a \cdot q_R - b \cdot p_R.
\]

As a consequence, the equilibrium market quality investment with endogenous demand is thus determined by the following two equations (remember that \( p_R = p = \frac{\tau}{n} \)):

\[
d = \frac{c}{\delta} n \cdot q,
\]

\[
d = A + a \cdot q - b \cdot \frac{\tau}{n}.
\]

Figure 1 displays the relation that lies between demand and quality and determines the market equilibrium.

³ In an appendix we discuss free entry by firms and compare it to the results obtained by Economides (1993).
Solving for the quality equilibrium with endogenous demand $q^E$, it is obtained that:

$$q^E = \frac{\delta (A - b \cdot \tau / n)}{cn - \delta a}$$

Comparative statics

Some comparative statics can be done by computing the following partial derivatives: $\frac{dq}{da} < 0$, $\frac{da}{dt} < 0$ and $\frac{da}{\lambda} > 0$. Thus notice that the impact of external effects and consumer ‘consciousness’ are analogous to the situation in which demand is exogenous: larger external effects reduce quality investments, and higher consumer consciousness increase quality choices. Notice however, that the impact of an increase in market competition measured as a reduction in transport costs has the effect of increasing market quality, a different result to that obtained by previous literature (Economides, 1993; Ma and Burgess, 1993, and Brekke et al., 2010, with utility linear in income as we have assumed). Higher competition among firms (lower $\tau$) decreases price and increases demand which has the effect of increasing the investment in quality.

Comparative statics with respect to $n$ are more problematic, for this we use figure 2 to understand and characterize the effect of an increase in $n$. The dotted lines represent what happens to the two equations with an increase in $n$. Notice that an increase in $n$ moves upwards...
both lines, but depending on the extent of such an upward move, quality might increase or decrease.

Figure 2

\[ d = \frac{c}{n} \cdot q \]

\[ d = A + a \cdot q - b \cdot \frac{\tau}{n} \]

Figure 2 shows that when \( \frac{c}{n} \) is small enough, and \( \frac{b \cdot \tau}{n^2} \) is large enough, then an increase in \( n \) implies an increase in (equilibrium) market quality. Previous analysis allows us to state the following result:

**Result 2:** With industry’s endogenous demand, market competition may increase or decrease market quality in the industry. On the one hand, when market competition is measured by transport costs, an increase in competition always increases market quality. On the other hand, an increase in the number of firms increases market quality only when the destination’s demand is very sensitive to prices and the number of firms is small.

(See the appendix for a full fledge proof.) When the competition rises because of an increase in the number of firms, prices fall. This fall stimulates a significant raise in the region’s demand when this is very sensitive to price and current competition is small. The higher demand motivates the firm to invest in quality, increasing the overall quality of the industry. The difference with respect to \( \tau \) is because an increase in competition with a reduction in \( \tau \) always has the effect of increase firms’ market share, and that’s why quality always increases. An
increase in n, however, will increase demand but might also decrease firm’s market share (because the number of firms has increased). That’s why an increase in n implies an increase in market quality only when demand raises sufficiently (when demand is very sensitive to prices and current number of firms is small).

With respect to the impact of consumer consciousness and external effects, they have the same sign as when demand is exogenous, namely, in equilibrium, industry’s quality increases when there is an increase in consumer’s consciousness, and when external effects are less important.

4 Social welfare, quality and regulation

Is (equilibrium) market quality optimal from the social point of view? A key issue regards the specification of the social welfare, which we assume includes firm’s profits and consumer surplus, namely:

$$ W = \sum_{i=1}^{n} \Pi_i + \int_0^1 d \cdot u_i \cdot di. $$

An important preliminary question when analyzing social welfare is whether the consumer’s utility derived directly from the warm-glow (that is, the one derived from λ) should be included in when optimizing social welfare. Andreoni (2006) provides a discussion of this issue concluding that it should be left out. Accordingly, in equilibrium, surplus for the average consumer is

$$ r + v \cdot q - p - \frac{r}{4n}, $$

since remember that in equilibrium \( q_R = q \). Then, in equilibrium, social welfare is as follows (substituting for the equilibrium price):

$$ W = n \cdot \left( \frac{\tau d}{n^2} - \frac{c}{2} q^2 \right) + d \cdot \left( r + v \cdot q - \frac{5r}{4n} \right). $$

When industry’s demand is assumed exogenous, an increase in quality investments \( q \) (or a reduction in prices) does not increase the destination’s demand (does not increase sales; it is a waste for industry profits, firms simply invest to ‘steal’ customers from other firms, but affects positively current consumers). It is then easy to compute the socially optimal \( q_W \) (taking as given the number of firms)

$$ q^W = \frac{vd}{cn}. $$

We follow the analysis in Brekke et al. (2010) in which n is taken as given, rather than the analysis in Economides (1993) in which optimality is analysed with endogenous entry.
Remember that market quality investment \( q^E \) obtained above with exogenous demand is given by \( q_E = \frac{cd}{cn} \). Then, since \( \delta \equiv \nu(1 - \alpha) + \lambda \), and it is assumed that \( 0 \leq \lambda \leq \alpha \nu \), this means that \( \delta \leq \nu \), which implies that \( q^W \geq q^E \), depending on parameters \( \alpha \) and \( \lambda \). More specifically, if \( \alpha > 0 \), then market quality will be below the socially optimal level, unless a ‘responsible consumer’ fully internalizes external effects by means of having \( \lambda = \alpha \nu \). Thus, when external effects are important, market quality will be tend to be below socially optimal, unless compensated by a large consumer consciousness.\(^5\)

**Endogenous demand**

When a circular city’s demand is endogenous (to quality and prices), an increase in quality investments increases the destination’s demand \( d \) which is now a function of \( q \), \( d = d(q) \). Thus, compared to the previous analysis, an increase in \( q \) has the positive effect of increasing sales and also increase consumer surplus (since the number of consumers increase). So now, social welfare is:

\[
W = n \cdot \left( \frac{cd(q)}{n} - \frac{c}{2} q^2 \right) + d(q) \cdot \left( r + \nu \cdot q - \frac{5r}{4n} \right).
\]

Remember that \( d = A + a \cdot q - b \cdot \frac{T}{n} \). Without much computation, it is easy to show that, with endogenous demand, socially optimal quality \( q^W \) is larger than \( q^E \), namely that \( q^E < q^W \).

The reason is that a social planner would consider the impact that an increase in quality investments have on industry’s demand, something not done by firms themselves (assumed to be price-takers). As a consequence, socially optimal quality is larger than (equilibrium) market quality:

**Result 3:** (i) With endogenous demand, market quality is smaller than socially optimal quality; (ii) With exogenous demand, market quality is smaller than optimal whenever there are external effects not compensated by ‘responsible consumers’; (iii) in any case, larger external effects in quality investments increase inefficiency in market quality provision.

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\(^5\) When the firm first chooses quality and then prices, market quality is smaller, which means that market quality will very likely be below optimal (unless there is a very large consumer consciousness). This result is also shown in Economides (1993).
(Proof is in the appendix.) To the extent that the presence of external effects impact market quality but do not affect social optimality, it follows that an increase in externalities increases inefficiencies (under-provision) of market quality.

**Regulation: a discussion**

Traditionally, quality concerns or inefficiencies have been addressed with several forms of regulation by the government, which is assumed to maximize social welfare. Traditional formal regulations that have been considered are: (i) limiting firm entry, namely setting a maximum $n$ of firms active in the market; (ii) technology standards (minimum environmental quality standards), namely, setting a minimum level of quality investment by each firm; (iii) subsidies, namely, to subsidize quality investments by firms; (iv) taxes, namely, putting a tax on each industry’s consumer (makes sense only with an endogenous demand); and (v) market transparency, namely, when the government may affect the level of market transparency, which in a reduced form we consider equivalent to an increase in $\lambda$ in our model. In spite that our framework is one of perfect information, in general consumers have no perfect information about the social attributes from which they derive warm-glow utility (e.g., environmental friendliness of a product). Then, a way to increase demand for such attributes is by means of increasing market transparency (Calveras and Gana, 2014). This is a more novel regulatory instrument available to governments, and specifically related to CSR.

In the present set-up, the regulator has three available instruments: (i) entry restriction; (ii) a quality standard, (iii) a quality subsidy; and (iv) an increase in market transparency. It is easy to discuss the impact of the latter ones by computing the following partial derivatives at the market equilibria (notice that in our model, an increase in subsidies $s$ is equivalent to a decrease in costs $c$): $\frac{dq^E}{ds} > 0$, $\frac{dq^E}{d\lambda} > 0$. The effect of entry restriction as a regulatory instrument on social welfare is more difficult to assess. First, the effect of the number of firms on market quality is uncertain as we have seen above, it depends on the parameter constellation, $\frac{dq^E}{dn} \geq 0$. And second, even if we know with precision the sign of the derivative (for instance assume it is negative and, thus, decreasing $n$ increases $q$) it is not straightforward the impact of a reduction in $n$ in social welfare. A binding entry restriction (reducing $n$) would also have the effect of

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6 An example of a transparency regulation is the European Union Directive 1999/94/EC which requires car makers to inform consumers on fuel economy and CO2 emissions of each car, as part of a “an overall Community strategy aimed [...] to reduce CO2 emissions, in particular those caused by passenger cars” (EU Directive 1999/94/EC).
reducing product variety, something valued by consumers. Thus, when the government chooses the optimal number of firms should also consider the way in which it affects product variety, in addition to its impact on market quality. The government should also keep in mind whether free entry implies too much entry or not, something analyzed and discussed by Economides (1993). This is all left for future research.

5 Sustainable tourism

The motivation behind the two additional assumptions (quality external effects, and industry’s endogenous demand) incorporated to the modelling quality competition in a spatial framework (à la Economides, 1993, and à la Brekke et al., 2010, and others) has been the tourism sector. As it has been recognized by the literature in tourism, environmental quality plays a major role in the development and competitiveness of a tourism destination (Huybers and Benett, 2000, 2003; Figini and Candela, 2013). Environmental quality relates to the natural and non-natural resources available to tourists at a tourism destination such as the landscape, beach and sea quality, the design of the surrounding buildings, etc. obviously, the impact of one hotel on the environment has consequences for the perceived quality of all the hotels in the area. Thus, externalities across hotels (and firms in general) constitute a key factor in understanding the industry (Calveras, 2003). Environmental quality is thus linked to the presence of external effects in ‘quality’ investments by firms: firm’s investments (in the building, in the surroundings, in waste management, etc.) not only affect and impact its own competitiveness, but also that of the other firms in the destination. This idea we have captured in our modelling with the composite index $q_{R}$ which is to represent the level of such environmental quality, and $\alpha$ denotes the extent to which tourism product is affected by it, and valued by consumers.

A second trait of tourism is the role that tourism destinations play in the tourism sector of the economy (see Andergassen et al., 2013). Competition in tourism takes place within and between destinations, a characteristic which our model addresses assuming industry’s demand is endogenous, dependent on firms choices on prices and (environmental) quality. Overall, incorporating external effects and quality and the industry’s endogenous demand to the model of Economides and Brekke et al. allows us to shed some light and discuss some of the issues that arise in relation to the sustainability of a tourism destination.7 Sustainable development in tourism has been studied plenty fold (see Candela and Figini, 2012, and references therein).

7 Other characteristics of tourism or a tourism destination such as, for instance, complementarities among different types of products, are not part of our analysis (Andergassen et al., 2013).
Environmental quality is jointly produced by all firms in the destination, giving rise to the tragedy of the commons: underinvestment in environmental quality (Baumol and Oates, 1988). Our analysis is able to provide an additional insight. Often, a policy recommendation includes entry restrictions with the basic idea of reducing free-riding in the funding of the common resource (quality investment in our framework). We have shown, however, that an increase in competition might in some cases enhance quality investments by firms and, accordingly, environmental quality of the destination. Thus, we show it is not necessarily the case that firm activity in tourism always hinders environmental conservation (Tisdell, 2001). More in general, an increase in market competition might be good through the increase in demand it generates, and the corresponding effect such an increase might have in supply, not only in terms of improved environmental quality, but also in terms of availability of specialized products or, as Andergassen et al., 2013, call it, organizational-product complexity in the destination. Giving a dynamic flavor to our static model, our result might suggest the necessity and optimality of an increase in the number of firms and market competition in the early developments of a tourism destination, while in later stages a continuous increase in market competition might be detrimental in terms of sustainability of the same destination (see Johnston and Tyrrell, 2005, as an example of a dynamic analysis of tourism sustainability).

Carrying capacity. One aspect not considered in our framework is that of a carrying capacity of a tourism destination. The carrying capacity is the maximum number of people that visit at the same time without compromising its environmental physical, economic and sociocultural characteristics and without reducing the level of satisfaction of tourists (Mathieson and Wall, 1982; UNWTO). We have assumed in our analysis that the number of tourists (consumers) have no negative impact on the environmental quality of the region. This might be easily changed by assuming, for instance, that the destination’s environmental quality is

$$q_R = \sum_{i=0}^{n} q_i/n - \theta(d),$$

where $\theta(d)$ is the external cost that the presence-arrival at the destination of $d$ consumers imposes on the overall-aggregate environmental quality of the region. Assuming $\theta(d)' > 0$ for all $d > 0$, $\theta(d)'' < 0$, and $\theta(0)' = 0$ would imply that there is a limited carrying capacity of the destination whereby beyond a given number of consumers, environmental quality of the region or industry is reduced. Assuming such external effects-costs in consumption to be convex (small for a few consumers and increasingly larger for many consumers) should qualify our main result (that an increase in competition might cause a larger investment in quality), but not necessarily eliminate it.
Regulation. Tourism sustainability very likely requires some form of governmental regulation (some market institutions designed to cope with the tragedy of the commons might also arise, such as, for instance, tour operators; Calveras and Vera-Hernandez, 2004). Regulation has been thoroughly discussed (Candela and Figini, 2012); and our analysis provides no additional interesting insights beyond the already mentioned caution on the use of entry restrictions to increase environmental quality. One interesting issue, though, relates to which should be the objective function of the government when implementing regulation. Often, a tourism destination (regional) government will only care about the industry and resident’s social welfare, not about tourists’ surplus. This might be incorporated into our analysis assuming that objective function \( W \) weights with less than one (even with a zero) consumer surplus. Such approach might reduce quality under-provision, but likely not eliminate it since each (price-taking) firm would still not fully internalize the impact of its quality investment in the whole of destination’s demand. Quality under-provision might nevertheless increase with large welfare effects of environmental quality on non-consumers residents, since firms are very likely not to consider them in their investment decisions.

Corporate social responsibility. Traditionally, formal regulation in tourism has consisted of eco-taxes, entry restrictions, and quality standards. Recently, voluntary initiatives have also been considered as possible mechanisms that, at least to some extent, are capable of providing some solution to the tragedy of the commons that involves environmental quality (Blanco et al., 2009). Increasingly, many consumers care about the impact that their purchasing decisions have on society (the natural environmental, etc.), also in the tourism sector. There is thus a demand for ‘responsible’ tourism which generates a push for corporate social responsibility (CSR). This mechanism we captured it through \( \lambda \) which increases willingness to pay of consumers (through a warm-glow of giving) for higher (environmental) quality products. In spite that this mechanism pushing for higher quality tourism is market driven, the government may still play a role in enhancing its effectiveness. All along our analysis we have assumed perfect information; nevertheless, consumers have no perfect access to the information on the way in which firms take care of the natural environmental, being this an important part of ‘responsible consumption’ in tourism. The government, by increasing market transparency with regards to firm’s practices may, therefore, enhance the effectiveness of ‘responsible consumption’ and increase corporate social responsibility. In our model this can be represented by an increase in \( \lambda \), which has the consequence of improving environmental market quality and, thus, contribute to the sustainability of the tourism destination (Blanco et a., 2009). Notice that such a
regulatory approach (an increase in market transparency) might very well be a \textit{win-win} strategy, improving tourism welfare as well as industry profits and destination’s resident welfare (Calveras and Ganuza, 2014).

6 Concluding remarks

Our analysis has allowed us to yield new light on the impact of market competition on quality choices by firms in a spatial framework (à la Salop). We have extended a model previously used by Economides (1993) and Brekke et al. (2010, 2012), with two additional assumptions: the presence of external effects in quality choices, and the (industry) circular city’s demand being endogenous to firm’s choices (price and quality). We have shown that in such a framework, and contrary to previous results (e.g. Economides, 1993), the impact of market competition on quality is a priori ambiguous. On the one hand, when market competition is measured by transport costs, an increase in competition always increases market quality. On the other hand, an increase in the number of firms increase market quality only when the destination’s demand is very sensitive to prices and the number of firms is small. In any case, we have also shown that all else equal, larger external effects in quality increase quality under-provision. Our theoretical framework corresponds closely to the characteristics presented by the tourism sector. Competition in tourism takes place both \textit{within and between} tourism destinations (Candela and Figini, 2012).\footnote{A tourism destination is defined and characterized by being that location – geographical space in which there is a presence of external effects among firms (as in the current paper’s case, in the environmental quality of the destination). Thus, the presence of external effects are key to talk about a destination; namely, a absent such external effects, a firm would be on its own, so that its competitiveness would rely solely on its own decisions and investments, unaffected by other firms and agent’s strategies (Candela and Figini, 2012).} Thus, in addition to spatial competition, both external effects in (environmental) quality and endogenous demand characterize closely the tourism industry. Our framework is thus very well fitted to shed some light on some of the issues relevant for a tourism destination, among them the issues of sustainability. Several issues are left for future research, both in the general framework as well as in the tourism context, salient among them, the analysis of free entry by firms, and its impact on social welfare (with special attention to quality provision).
7 References


Calveras and Ganuza, 2010, "Responsabilidad Social Corporativa. Una visión desde la Teoría Económica", Cuadernos Económicos del ICE nº 76


Tisdell, C., 2001, Tourism Economics, the environment and development: analysis and policy, chapter 2: “Tourism, the environment and profit”, Edward Elgar, Cheltenham.
Figure 1

\[ d = \frac{c}{\delta} n \cdot q \]

\[ d = A + a \cdot q - b \cdot \tau / n \]
Figure 2

\[ d = \frac{c}{\delta} n \cdot q \]

\[ d = A + a \cdot q - b \cdot \frac{t}{n} \]
8 Appendix I: proofs

Proof of result 1: In the text.

Proof of result 2: With endogenous demand, market quality is

$$q^E = \frac{\delta (A - \frac{\tau}{n})}{cn - da} = \frac{\delta (A - \frac{\tau}{n})}{\frac{1}{c} - \frac{da}{cn}}$$

Then

$$\frac{\partial q^E}{\partial n} = \frac{b \cdot \frac{\tau}{n^2} (n - \frac{da}{c}) - (A - b \cdot \frac{\tau}{n})}{(1 - \frac{da}{cn})^2}.$$ As a consequence,

\[
\text{sgn}\left(\frac{\partial q^E}{\partial n}\right) = \text{sgn}\left\{b \cdot \frac{\tau}{n^2} \left(n - \frac{da}{c}\right) - \left(A - b \cdot \frac{\tau}{n}\right)\right\},
\]

which means that \(\text{sgn}\left(\frac{\partial q^E}{\partial n}\right) \geq 0\) if and only if

\[
b \cdot \frac{\tau}{n^2} \left(n - \frac{da}{c}\right) - \left(A - b \cdot \frac{\tau}{n}\right) \geq 0.
\]

With some algebra, this turns into

\[-cAn^2 + 2b\tau cn - b\tau da \geq 0.\]

With \(n=0\), the parabola takes value \(-b\tau da\) and thus crosses the \(y\) axis at the negative part. Given that when \(n\) becomes smaller, the parabola becomes more negative, and assuming a real solution exists (see below), then the parabola crosses the \(x\) axis at the positive part, with both solutions, \(n^-\) and \(n^+\), being positive. As a consequence, we have that

$$\frac{\partial q^E}{\partial n} > 0 \text{ for } ne(n^-, n^+), \text{ and } \frac{\partial q^E}{\partial n} \leq 0 \text{ for } n \geq n^+.$$

Notice that

$$\frac{2b\tau c + \sqrt{(2b\tau c)^2 - 4cAb\tau da}}{2cA}.$$

Then, in order to have real solutions we simply need to assume that \((2b\tau c)^2 - 4cAb\tau da > 0\), which is \(b\tau c > A\delta a\). Otherwise, no real solutions exist, the parabola never crosses the \(x\) axis and, as a consequence, \(\frac{\partial q^E}{\partial n} < 0\) for all \(n\). \textbf{QED}

Proof of result 3:

Remember that \(d = A + a \cdot q - b \cdot \frac{\tau}{n}\). Objective function is

\[W = n \cdot \left(\frac{\tau d(q)}{n^2} - \frac{c}{2} q^2\right) + d(q) \cdot \left(r + v \cdot q - \frac{5\tau}{4n}\right)\]

Then:

\[
\frac{dW}{dq} = \frac{\tau d'}{n} - ncq + d' \cdot \left(r + v \cdot q - \frac{5\tau}{4n}\right) + v \cdot d
\]

\[
= \frac{\tau a}{n} - ncq + a \cdot \left(r + v \cdot q - \frac{5\tau}{4n}\right) + v \cdot \left(A + a \cdot q - b \cdot \frac{\tau}{n}\right)
\]

\[
= \frac{\tau a}{n} + a \cdot \left(r - \frac{5\tau}{4n}\right) + v \cdot \left(A - b \cdot \frac{\tau}{n}\right) - (nc - 2av) \cdot q
\]

As a consequence, it is easy to compute \(q^W\) (notice that second order condition for \(q^W\) to be a maximum is \(nc - 2av \geq 0\)):
We can now compare $q^W$ with $q^E = \frac{\delta (A - b \cdot \frac{1}{n})}{cn - 2va}$. Since recall that $\lambda \leq av$, this means that $\delta \leq v$. As a consequence, $cn - \delta a \leq cn - va < cn - 2va$. Thus,

$$q^E = \frac{\delta (A - b \cdot \frac{1}{n})}{cn - \delta a} < \frac{\delta (A - b \cdot \frac{1}{n})}{cn - 2va} \leq \frac{v (A - b \cdot \frac{1}{n})}{cn - 2va} < q^W$$

Furthermore, since $\frac{dq^E}{d\alpha} < 0$ and $\frac{dq^W}{d\alpha} = 0$, it is immediate that the difference between $q^E$ and $q^W$ increases with larger external effects. QED.

**Proof of result 4:** In the text.

9 Appendix II: entry

As in Economides (1993), we analyze entry for the case in which demand is exogenous in order to look at the effect that external effects have on it. Assume that entry entails a fixed cost $F$, and as usual we study firm’s entry assuming firms enter as long as profits are non-negative. Firm’s profits are as follows:

$$\Pi_i = p_i \cdot D_i - c(q_i) - F = \frac{\tau d}{n^2} - \frac{c}{2} \left( \frac{2 \cdot \delta}{3 \cdot c} \right)^2 - F.$$

Assuming a zero-profit condition, the equilibrium number of firms $n^*$ is:

$$n^* = \sqrt{\frac{1}{F} \left( \frac{\tau d}{c} \left( \frac{2d\delta}{3c} \right)^2 \right)}.$$

From this expression, we obtain that an increase in quality externalities (a larger $\alpha$) increases entry ($n^*$). There is like a vicious circle: an increase in $\alpha$ reduces quality investments which increase entry, which further reduces quality investments. This is so (as we will see in the next section) because demand does not depend on quality neither quantity nor price; as a matter of fact, a smaller level of quality investment is good for industry profits (but bad for consumers and environmental quality). Economides (1993) shows that there is too much entry by firms. This is so because of its impact on quality which hurts consumers. As a consequence, it is easy
to show that the same result is present when there are quality externalities since they simply reinforce such a result.

**Result 2:** Larger quality externalities increase firms’ entry.