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by

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Quality Externalities among Hotel Establishments: What is the Impact of Tour Operators?*

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Abstract

This paper is about quality decisions in a vertical structure where competitive producers sell to 'powerful retailers'. Specifically, we focus the analysis on the role played by a tour operator (TO) on quality investments when distributing the capacity of a given tourist destination. We emphasize the presence of quality externalities among hotel establishments, and see that sometimes a TO distribution can provide a solution to the 'tragedy of the commons' in quality provision. Thus, we analyze what implications do vertical relations have for quality in this industry, and then derive some policy recommendations.

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1 Introduction

Tourism is clearly an important economic sector from an international perspective. The number of international tourists travelling in the world reached 664 million in 1999. France, Spain and United States were the world's top three destinations. United States, Germany and Japan spent US$ 141 billion on international tourism in 1999.[1] Features such as market power, vertical relations and externalities make the tourism sector interesting from an economic perspective. However, there is not, to our knowledge, sound theoretical analysis that closely looks at the sector.

Our aim is precisely to contribute to fill this gap. Specifically, this paper is about quality choices in a vertical structure where competitive producers sell to 'powerful retailers'. Our framework emphasizes the presence of quality externalities among producers. It is thus particularly suited to study the ingredients that determine quality in the tourist resort industry and about the role played by tour operators.

Environmental issues are increasingly being perceived as important in the tourism sector. According to Bywater(1992) "The demand for a higher quality product is universal across Europe. (It) is expressed not just in expectations of the standard of the accommodation and service at the destination, but also in demand for a better environment". In the same line, Huybers and Bennet (2000) study the relative importance of the natural environment on the choices made by UK prospective tourists regarding the overseas holiday destinations. They highlight the importance of the environment among the attributes of holiday destinations. In fact they found that potential overseas tourists were willing to pay a substantial premium to visit a destination with a high level of environmental quality.

Indeed, a distinguishing feature of this sector of the economy is that the quality of a specific resort affects the environment and thus the quality of the region where it is located so that there exist externalities across hotel owners in a specific zone. The question arises as to what implications do vertical relations have for quality in this industry and whether there is a role for public policy.

To the extent that a tour operator acts as a distributor of a large share of the supply in a region, it provides a solution to the commons' tragedy that affects hotel owners since it can negotiate price schedules conditional on quality upgrades. However, tour operators exhibit market power (e.g. Baum and Mudabi, 1994), and as a consequence, they have an incentive to restrict the capacity they distribute to the market segment that it is under their control. This goes against the TO's ability to increase the quality of the region by contracting with many hotels, requesting quality upgrades and internalizing the quality externalities.

[1] World Tourism Organization (2000).

Thus, our first result is to show that the TO faces a basic trade-off: in order to have incentives to request quality upgrades from the HOWs it contracts with, it should distribute a large enough capacity; however, market power leads him to restrict the capacity it distributes. In the resolution of this trade-off, the capacity of the region plays an important role. If there is a large accomodation capacity in the region, the tour operator would have to contract with too many hotels if he wanted to substantially increase the quality of the region. This could imply a too large reduction in the price charged to tourists.

The presence of this trade-off drives the second result of the paper. We show that the impact of the monopolistic tour operator on quality depends on the existing capacity, and hence there can be an important role of public policy. More specifically, we identify conditions under which in equilibrium the TO will request quality upgrades. While a minimum accommodation capacity is required to insure that the TO has incentives to request quality upgrades, if there are too many hotels the tour operator will find more profitable not to increase the quality of the region. Next, we study how alternative vertical structures influence quality choices by the establishments of the region. We find that reducing the monopoly power of the tour operator may have very different consequences on quality depending on whether market power is eroded through cooperation of hotel owners or through internet direct distribution to tourists. Indeed, while eroding monopoly power via the joint venture will result in overall higher quality levels, internet direct distribution will decrease overall quality, since then no internalization of the quality externalities will take place.

Our focus is on the role of an intermediary in the provision of quality in a framework with perfect information. Therefore, by assumption, we exclude the role of intermediaries as agents who can become 'experts' as in Biglaiser (1993) and Biglaiser and Friedman (1994). Likewise, we rule out investigating the intermediaries' incentives to reveal and certify quality as in Lizzieri (1999) or Admati and Pfleider (1986, 1990). We also depart from the strand of the literature dealing with the intermediaries' quality as, for instance Matutes and Vives (1996).

In our setting access to customers is an 'essential facility'. Unlike the theory of 'essential facilities', (see Rey and Tirole (1997) for a survey) we do not address the possibility of foreclosure through contractual restraints or vertical integration. Yet, some of the ingredients present in our model appear in the literature exploring vertical restraints (e.g. Mathewson and Winter (1984) and Rey and Tirole (1986)). Mathewson and Winter (1984), for instance, assume that there are informational externalities across differentiated retailers, which as a result advertise less than optimal whenever the marginal price they pay equals or exceeds the cost of production. A manufacturer will give incentives to retailers to optimally advertise by offering a contract with a two part tariff and will set the marginal price below cost. Rey and Tirole (1986) study retail price maintenance and exclusive territories as ways to mitigate the problem of externalities among retailers. In contrast to previous literature, in our framework externalities arise among producers (rather than among retailers). To our knowledge, ours is the first paper to emphasize the presence of externalities among producers, and explore in which way do vertical relations affect quality choices in such a framework.[2]

The paper proceeds as follows. Section 2 presents the model and section 3 characterizes the equilibrium. Section 4 analyzes alternative vertical structures, and section 5 concludes with some discussion of the empirical evidence and of the policy implications of the paper. All proofs are relegated to a technical appendix.

2 The model

We envision the tourist sector as one where relatively small but not powerless hotel owners (HOWs) negotiate with a rather powerful tour operator (TO). We also take the view that quality is an important element in these negotiations. As an example, TUI, the largest European TO, surveys hotels they contract with using a environment checklist that includes information on hotel's steps and activities to protect the environment.[3]

More specifically, we focus on the negotiation between a TO who 'controls' the distribution for tourist services in one demand segment, which, for instance, corresponds with a given country, and a series of hotel owners (HOWs). On one hand, we model TOs that exhibit substantial market power. Fitch (1987), Baum and Mudabi (1994) and Evans and Stabler (1995) confirm this hypothesis.[4] Morover, the industry trend is nowadays clearly towards concentration as Thomson, the first player in the UK market also controlling 40% of the Scandinavian market accepted the take over offer of Preussag, the biggest German counterpart.[5][6] On the other hand, we model HOWs that are small, yet not powerless, since they have the option to trigger to a different demand segment, i.e., to sell their product in the international market (i.e. a different country), and obtain the profit of this outside option.

[2] Cabral (2000, chapter 11) presents a short and descriptive example of training externalities between car producers, which, in contrast to our externalities, can be solved by means of exclusive dealing.

[3] The checklist includes information as water waste treatment and energy savings. This information was obtainned from TUI website visited on April 25, 2002. http://www.tui-umwelt.com/cms-site/index.php3?lg=3&t1=2&t2=1&t3=0&t4=0

[4] Gratton and Richards (1997) find mixed evidence: whereas the UK TO market seems to be constestable, the German one is a stable oligopoly.

[5] See The Economist, May 20, 2000

[6] Tour Operators had traditionally kept their markets rather segmented, with the British TOs controlling UK and the Scandinavian countries, while German tour TOs expanded around Belgium and Holland, see Bywater(1992).

We consider fixed hotel capacity. When negotiation with the TO takes place, the HOWs have already chosen some certain ex-ante quality level, for instance they have built in a specific location, and thus the quality of the construction is already in place, just as the swimming pool, or other recreational facilities. The TO, however, can negotiate some quality upgrading. For instance, it can request the building to be painted, the gardening improved, or the furniture replaced. Indeed, quality upgrades are an essential component of negotiations between HOWs and TOs, who may accept to pay higher prices, provided some investments to improve the hotel are made.

Next, quality externalities are an essential building block of our framework. In practice, both the ex-ante quality choice and the quality upgrades have an impact on the intrinsic quality of the hotel and also affect the environment, hence the average quality of the region. Thus, we think of the quality of the region as a function of the intrinsic quality of all the hotels in the region. For instance, the design of the surrounding buildings can be as important as the design of the own hotel; or one is likely to meet customers of nearby hotel in restaurants, beach etc., so if one customer dislikes night life, may be he should not choose some areas, regardless of what the intrinsic characteristics of a hotel are. Most importantly, hotels can be more or less environment friendly depending on how they dispose of garbage, residual waters etc. Clearly, the impact of one hotel in the environment has consequences on the perceived quality of all the hotels in the area. Hence, externalities across hotels are a key factor to understand the industry.

The presence of these externalities creates a common's problem: quality is jointly produced by all HOWs in the region. In consequence, quality will tend to be underprovided in our setting. However, the TO internalizes the benefit generated by quality upgrades, and can provide incentives to do them by setting the appropriate prices.

In the following we present the timing and the details of the model. The timing is as follows:

Stage 1: Negotiation between the TO and the HOWs

The tour operator (TO) chooses with which HOWs to negotiate, and offers them a price. The price can be conditional upon a quality upgrade (and upon initial quality). That is, the TO can offer prices y_0^j to n_0 HOWs of quality j for their capacity; in addition, it may choose to offer a price y_1^j to n_1 HOWs in case they invest in upgrading their quality. HOWs accept or reject the offer.

Stage 2: Quality upgrades

HOWs who have signed contracts to upgrade the quality do their investment. The rest of HOWs might also upgrade their quality.

Stage 3: Production and Payments

The TO sells the capacity it has bought in his home market, and payments are made. Those HOWs who rejected the offer or were not proposed a deal by the TO obtain their outside option.

Hotel establishments and the production of quality

For the sake of simplicity, we focus on a scenario in which there is a mass n of infinitesimal hotels with unit capacity and zero operational costs. Each hotel belongs to a different HOW.[7] Each infinitesimal hotel has already chosen some certain ex-ante quality level, for instance they have built a specific location, and thus the quality of the construction is already in place. This ex-ante quality has been chosen prior to the negotiations with the TO. For simplicity, we assume it does not exhibit externalities, and that it is the same for each hotel establishment, that is $\widehat{Q}$.

When negotiations with the TO take place, the TO can impose some quality upgrading by a discrete amount of Δ. The cost of this quality upgrading is $c > 0$. Given the nature of the problem we analyze, we assume that quality upgrading has full external effects, hence quality upgrading determines the environmental quality of the hotel. The overall quality of a hotel is then given by a weighted average of its ex-ante quality and the average environmental quality of all hotels in the region. In particular, if n_1 HOWs have upgraded their quality, the overall quality of hotel i is:

$$q_j = \alpha\widehat{Q} + (1-\alpha)\frac{1}{n}\int_0^{n_1} \Delta di.$$

Thus, unless upgrades are contracted upon with the TO, individual HOWs will never have the incentive to invest in upgrading, since they are infinitesimal and their quality is not affected.

Outside option of HOWs

The outside opportunity of a hotel of quality j is given by $Ej = E(q_j)$, where

$$E_j(q_j) = \mu + \beta q_j,$$

with $\mu > 0$ and $\beta > 0$. Thus, if the TO negotiates with a hotel of quality q_j it must offer a price $y_0 = E_j$ and, in case it requests a quality upgrade it must offer a price $y_1 = E_j + c$.[8] Otherwise the hotel owner would reject. We assume that the TO is strategic in that it realizes that requesting upgrades enhances the quality of the region and it thus increases the outside option. On the other hand, for the sake of simplicity, the outside option does not depend on quantity which basically means

[7] Calveras (2002) analyze the interaction between expansion strategies by hotel chains and enviromental quality.

[8] Notice that because both the quality upgrade is a public good and firms are infinitesimal, the outside opportunity of a firm is independent on whether or not it does the quality upgrade: hence its costs must be fully covered.

that the tourist region is small relative to the international market that does not operate through the TO.

Thus, we model the outside option in a reduced form. Presumably, the outside option when dealing with a powerful UK TO is to deal with another powerful, perhaps a German TO, and thus TOs compete for capacity (more than for customers since markets are quite segmented). We ignore these complex strategic interactions between TOs while at the same time incorporating the fact that the TO, while powerful, cannot completely expropriate the profits of HOWs.

Demand for Tourist Services in the TO market segment

The market where the TO distributes the tourist services is as follows. As in Shaked and Sutton (1982), consumers have unit demands and different valuations for quality, represented by the parameter θ. There is a mass 1 of consumers with their valuation for quality uniformly distributed in the interval $[0, 1]$. Thus, the utility function of a tourist i with valuation for quality θ_i is given by

$$u_i = \theta_i \cdot q - p,$$

where q is the quality of the tourist destination it visits, and p is the price paid. We assume that consumers can choose to visit a destination with the services sold by the TO at prices and qualities (p, q), or go to the rest of the world, of higher quality, q_R, and price p_R (which makes sense since we are analyzing a problem of quality underprovision). Thus, the indifferent tourist is that with a valuation for quality $\overline{\theta}$ for which $\overline{\theta} \cdot q - p = \overline{\theta} \cdot q_R - p_R$, which implies $\overline{\theta} = \dfrac{p_R - p}{q_R - q}$. Therefore demand and inverse demand functions are, respectively,

$$\begin{aligned} n_{TO} &= \int_0^{\overline{\theta}} ds = \overline{\theta} = \frac{p_R - p}{q_R - q}, \\ p &= p_R - (q_R - q) \cdot n_{TO}, \end{aligned}$$

where n_{TO} is the quantity sold by the TO in its market segment.

3 Equilibrium

Given that there are n HOWs in the market, all with the same basic quality $\widehat{Q}$, how many HOWs will the TO contract with, and how many will be requested to upgrade quality in stage 1? Notice that when requesting a HOW to upgrade its quality, the TO must pay him its outside option plus the full cost of upgrading c. Otherwise, the

HOW would not agree to sign such a contract. The TO problem is thus

$$\max_{\{n_0,n_1\}} \int_0^{n_0} (p - y_0)di + \int_0^{n_1} (p - y_1)di$$

subject to

$$\begin{aligned} y_0 &= E(q), \\ y_1 &= E(q) + c, \\ n_0 + n_1 &\leq n, \\ n_1 &\geqslant 0, n_0 \geqslant 0. \end{aligned}$$

where n_0 is the hotel capacity contracted by the TO that is not requested quality upgrading and n_1 is the hotel capacity that is requested quality upgrading; and y_0, y_1 is the price paid by the TO to the HOWs, depending on whether quality upgrading is requested (y_1) or not (y_0). By substituting y_0 and y_1, it is immediate to see that the problem becomes:

$$\max_{\{n_0,n_1\}} (p - E(q)) * (n_0 + n_1) - c * n_1$$

subject to

$$\begin{aligned} n_0 + n_1 &\leq n, \\ n_1 &\geqslant 0, n_0 \geqslant 0. \end{aligned}$$

Recall that since upgrades are a pure public good only hotels who are requested and given incentives by the TO will upgrade their quality. It follows that the quality marketed by the TO is $\widehat{q} = \alpha \cdot \widehat{Q} + (1 - \alpha)\,\Delta \frac{n_1}{n}$. The following lemma starts characterizing the solution of the TO problem.

Lemma 1 *The TO requests quality upgrades from all the hotels it contracts with or from none.*

Proof. All proofs are in the appendix. ■

The intuition is as follows. Since upgrades are a pure public good, the TO cannot extract more from the hotels that are requested to upgrade than from the others. In fact, since all HOWs have the same outside option, the TO must give incentives to HOWs to invest in upgrading and cover the whole cost. There are two possibilities then: either the higher revenue that the TO can set for the higher quality upgraded product covers or does not cover the cost in upgrading the quality. The latter includes not only the direct cost paid to the HOWs requested to upgrade, but also an indirect cost given by the fact that the higher quality of the region results in higher outside opportunity cost for all the HOWs.

Lemma 2 *There might be two local optima, which are candidate to being the optimal solution of the TO problem. In one, the TO contracts with n_0^{TO} hotels where*

$n_0^{TO} = \min\left[n, \widehat{n}_0 = \dfrac{p^r - \mu - \beta H_1}{2(q^r - H_1)}\right]$, *and requests no quality upgrades.* n_0^{TO} *is a local optimum when* $n_0^{TO} < \frac{\beta}{2} + \left(\frac{\beta^2}{4} + \frac{c \cdot n}{(1-\alpha)\Delta}\right)^{\frac{1}{2}}$. *In the other one, the TO contracts with* n_1^{TO} *hotels and requests them to upgrade their quality, with* $n_1^{TO} = \min(n, \widehat{n}_1)$, *where* $\widehat{n}_1$ *is the negative root of the following equation:*

$$3H_2(\widehat{n}_1)^2 + 2(H_1 - q^r - \beta H_2)\widehat{n}_1 + p^r - \mu - \beta H_1 - c = 0.$$

n_1^{TO} *is a local optimum when* $n_1^{TO} > \frac{\beta}{2} + \left(\frac{\beta^2}{4} + \frac{c \cdot n}{(1-\alpha)\Delta}\right)^{\frac{1}{2}}$.

These lemmas lead us to the following propositions, where we first examine quality upgrading conditions in case the TO contracts with all HOW in the region. Notice that this is a useful benchmark since in this case the TO fully internalizes all the quality externalities. However, this does not mean that the TO will always upgrade quality since it has to bear both the direct and indirect costs of doing so.

Proposition 1 *When the TO contracts with all HOWs, it imposes quality upgrading if and only if* $n > \frac{c}{(1-\alpha)\Delta} + \beta$.

When the Tour Operator contracts with all HOWs it internalizes all externalities from quality upgradings. In order to request upgrading to all HOWs, there needs to be a minimum capacity (relative to both direct and indirect costs of upgrading) such that the externalities that arise from quality upgrading are profitable. Notice that the ratio between c and $(1 - \alpha)\Delta$ reflects that the cost must be small relative to the increase in quality due to upgrading $(1 - \alpha)\Delta$. A small β indicates that the outside option will not increase much due to the upgrading.

In many cases however, the TO will not contract with all the HOWs of the region. This erodes the incentives of the TO to request quality upgradings. On one hand, the TO is the only one that pays both the direct and the indirect costs of upgrading; on the other hand, it does not fully internalize the benefits of upgrading, since some HOWs do not contract with the TO but benefit of a region where some hotels have been upgraded. One possibility for the TO would be to contract with more HOWs so as to be able to internalize to a greater extent the externalities that accrue from quality upgrading. However, increasing the capacity it distributes to its own market segment implies a reduction in the price tourists pay, a reduction which is non optimal beyond a certain level.

Thus, we see there exists a trade-off in the strategy of the TO. Contracting with more HOWs is good because of the larger internalization of the externalities that accrue from quality upgrading. However, this also implies a reduction in the price it can charge. And by limiting the distribution of capacity to its own market segment, the TO dilutes its incentives to undertake quality upgrading.

This trade-off explains why in many cases the TO will not contract with all HOWs, in spite this means less quality upgrading, or no quality upgrading at all. Then, upgrading will only take place when capacity is not too large, and we expect that there still exists a minimum capacity of the region in order to require quality upgrading. The following proposition formalizes these intuitions,

Proposition 2 *When the TO does not contract with all the HOWs, then*

1. *for* n *'neither too large nor too small' the optimal strategy is to impose quality upgrades provided that* β *and* c *are 'small enough'.*
2. *when* n *is very large, the TO does not require any quality upgrading to the HOWs it contracts with.*

The TO will request quality upgrading when capacity is not too large, even when it does not completely internalize all quality externalities, for small upgrading costs and small sensitivity of outside option to quality. However, when capacity is very large the benefits of upgrading dilute too much among HOWs that have not contracted with the TO, hence the TO does not find profitable to request quality upgrading.

It is clear then the role of the intermediary (the TO) in solving the tragedy of the commons in the provision of the public good. The TO faces a trade-off when deciding with how many HOWs to contract with. On one hand, contracting with more HOWs increases the internalization of the externalities of quality upgrading, and thus increases the incentives to undertake such upgrading. On the other hand, since the TO enjoys market power in its own market segment, a larger contracting and distribution of hotel room capacity beyond a certain level will cause a non optimal reduction in the price the TO can charge to tourists.

4 Alternative vertical structures

Now, we asses quality investments in our model relative to two other vertical structures. The first one is a competitive industrial structure where HOWs directly distribute through internet to all tourists their hotel rooms. The second is one where all HOWs in the region form a joint venture to jointly market their rooms.

4.1 Internet distribution without tour operators: competitive outcome

Assume that consumers in the TO market gain access to internet and can thus buy directly from the HOWs without any intermediation. Any HOW would supply its capacity to this market if the price exceeded E, the outside opportunity. In other words, direct distribution through internet would act as if the tour operator were replaced by an auctioneer that allocates hotels to the TO market and to the outside option so that, given prices, revenue cannot be increased by reassigning hotels. Thus, the auctioneer will assign capacity to the TO market and to the rest of the world market so that $P\left(q, n_{TO}^{A}\right) = E\left(q\right)$.

The following proposition analyzes the impact of eliminating monopoly power through internet direct distribution.

Proposition 3 *1. When distribution is done directly through internet, there is no quality upgrading.*

2. When HOWs distribute their rooms directly through internet, more capacity is allocated to the TO market, and therefore less to the outside option market.

The first result is immediate from the assumption that firms are infinitesimal. Since there is no TO that requires quality upgrading through a contract, it is never in the interest of HOWs to upgrade the quality of their hotels. And the second result is also clear: as long as $p > E$ the auctioneer will allocate hotel rooms to the market instead of to the rest of the world, that provides the outside option.

Thus we see that when distribution of capacity is done through internet, profits of HOWs are smaller than when the TO distributes and requests quality upgrading. On one hand, with internet distribution there is no quality upgrading at all in hotel rooms, which decreases the value of the outside option to HOWs that distribute to the rest of the world. On the other hand, HOWs who distribute to the 'TO market' also obtain this lower outside option (since $p = E$).[9]

4.2 A joint venture: a TO controlled by HOWs

We next consider the case where competitive HOWs in the industry associate and form a TO which will control the distribution both to the TO market and to the rest of the world. That is, we consider the case where the industry-controlled TO (ICTO) maximizes joint profits of all HOWs of the resort, and then its profits are distributed among all member of the industry. Thus the objective function of the ICTO is

$$\pi = p \cdot n_{TO} + (n - n_{TO}) \cdot E - c \cdot n_U,$$

where n_{TO} is the capacity distributed to the former 'TO market', and n_U is the capacity of the region to which the ICTO requests quality upgrading. Notice that the ICTO, since it also distributes the region capacity to the rest of the world, can also request quality upgrading (and pay c for it) to the HOWs who distribute their

[9] This is under the assumption that n is large enough so that in equilibrium is distributed to the rest of the world.

capacity to the outside option market (rest of the world), and not only to the ones that distribute to the former 'TO market'.

The following proposition states that it is sometimes in the benefit of the ICTO to request quality upgrades to the hotels that distribute their capacity to the rest of the world sometimes.

Proposition 4

1. *The ICTO requests quality upgrades to all HOWs of the region or to none.*
2. *For the same capacity distributed to the former TO market, the ICTO requests quality upgrades to HOWs for a strictly larger parameter constellation than the TO monopolist does.*
3. *When costs of quality upgrades are not so large, increases in capacity do not reduce quality of the region.*

When the ICTO decides to request quality upgrading, it does so to more HOWs than the TO, specifically to all HOWs of the region. When deciding the contracts, an ICTO internalizes all externalities of upgrading quality on all HOWs of the region, not only the ones that it distributes to the former TO market. This of course increases the incentives to request quality upgrading. Furthermore, the effect of quality upgrading in increasing the outside option is not a cost for the ICTO (as opposed to the monopolist TO).

Furthermore, the ICTO does not face the trade-off that the TO monopolist faces. As we explained above, the monopolist is able to internalize the externalities of the quality upgrades to a larger extent as long as it contracts with more HOWs and distributes them to the TO market. But this pushes down prices it can charge to the tourists. Now, the ICTO captures all benefits of quality upgrades without having to increase the capacity that it distributes to the former TO market since it can request quality upgrades to the HOWs that distribute to the rest of the world.

5 Discussion and concluding remarks

The aim of this paper has been to analyze the role played by tour operators in the (environmental) quality investments of a given tourist destination. The presence of quality externalities among hotel establishments makes that TOs can play a role in the 'tragedy of the commons' in the quality provision of the destination. We have shown that the TO faces a fundamental trade-off. On one hand, increasing the capacity it distributes implies higher incentives to require quality upgrading from the hotels, since then the TO internalizes to a larger extent the externalities of quality investments. On the other hand, since the TO enjoys market power in the demand segment it is serving, it has an incentive to restrict capacity to maintain higher prices. This trade-off limits the ability of the TO to solve the 'tragedy of the commons' in the provision of quality.

We have also studied the effect of alternative vertical structures on the quality investments in a tourist destination. Inducing cooperation of the HOWs of a region to form a joint venture to market its distribution through an industry controlled tour operator (ICTO) is a better organizational alternative than promoting internet direct distribution of hotel capacity. This is so because the former further enhances incentives to undertake quality investments, whereas the latter eliminates these incentives.

Empirical evidence

There exists some evidence on the role played by TOs in the enhancement of quality, including (but not only) environmental quality, both at an establishment and at a regional level. Several papers show the role of TO distribution in the adoption by hotel establishments of environmental management practices. Llull (2001) finds that tour operators are the main agents (only after hotel shareholders and managers) that influence environmental consciousness of hotel establishments, well before suppliers, public administration, environmental regulation and competition. Crespi and Orfila (2002) find a positive and significant correlation between TO contracting and the adoption of environmental innovations by Balearic hotel establishments. Gonzalez and Leon (2001), in an analysis of environmental management of Spanish hotels, obtain that stakeholder, including TOs, pressures help explain environmental management development.

There is also firm specific evidence. According to its website, since 1992 the leading European tour operator TUI surveys hotels they contract with using the TUI environment checklist. One of the stipulations of TUI contracts is that this checklist be filled out annually, with which the hotel management provides information on the hotel's steps and activities to protect the environment. The environment checklist serves the Environment Division in assessing sustainable measures of individual hotels or hotel chains as well as of the hotels in holiday regions or countries as a whole.

Policy implications

Quality is a permanent issue in the agenda of tourist regional governments and tourism organizations, with a wide array of available policy instruments. We now discuss some policy implications that are derived straight from our previous analysis, focusing on capacity and entry regulation, and the organization of distribution.

First thing we have shown is that only when the TO contracts with all the HOWs of the region, increasing capacity will never reduce quality. We have shown that when the tour operator does not contract with all hotel establishments, an increase in capacity may imply a reduction in the quality requirements of the tour operator. A higher capacity implies that the TO does not capture the effects of quality upgrading, and hence dilutes its incentives to request the hotels to upgrade their quality. Thus, such an effect provides a rationale for capacity and entry restrictions that are present in many tourist destinations. Otherwise, increases in region capacity can imply a reduction in the quality of the resort. An example of these capacity regulations can be found in two important Spanish tourist regions. In both Balearic and Canary Islands, the local governments have recently established capacity restrictions not allowing new hotels to be built, unless old ones have been demolished.

Second, there are several examples of (successful or not) attempts made by HOWs of a tourist destination to jointly market the overall capacity of the region (e.g. Saturno ICTO in the Canary Islands). Our analysis supports governmental policies that encourage such association, since a joint venture of HOWs will imply an increase in the regional overall quality. On the other hand, the possible trend towards internet direct distribution undertaken by hotel chains and establishments should be seen with precaution by the authorities, for its implications concerning quality investments.

6 Appendix

Proof. of lemma 1.

For notational purposes let $H_1 \equiv \alpha \cdot \widehat{Q}$ and $H_2 \equiv \frac{(1-\alpha)\Delta}{n}$. Then $q = H_1 + n_1 H_2$. First, we analyze for $n_0 + n_1 < n$. Then, first derivatives of the TO profit function are:

$$\begin{aligned}
\frac{\partial \pi}{\partial n_o} &= p - E + (n_o + n_1)(q - q_R), \text{ substituting } p, E \\
&= p_R - \mu - \beta q + 2(q - q_R)(n_0 + n_1), \text{ substituting } q, \\
&= 2H_2(n_1)^2 + n_1(-\beta H_2 + 2H_1 - 2q_R) + \qquad (1) \\
&\quad 2H_2 n_o n_1 + 2(H_1 - q_R)n_o + p_R - \mu - \beta H_1. \qquad (2) \\
\frac{\partial \pi}{\partial n_1} &= \frac{\partial \pi}{\partial n_o} + (n_o + n_1)^2 H_2 - \beta H_2(n_o + n_1) - c \qquad (3)
\end{aligned}$$

The second derivatives are

$$\begin{aligned}
\frac{\partial^2 \pi}{\partial n_o^2} &= 2H_2 n_1 + 2H_1 - 2q_R, \\
\frac{\partial^2 \pi}{\partial n_o \partial n_1} &= 4H_2 n_1 + 2H_2 n_0 + 2(H_1 - q_R) - \beta H_2, \\
\frac{\partial^2 \pi}{\partial n_1^2} &= \frac{\partial^2 \pi}{\partial n_o \partial n_1} + 2(n_0 + n_1)H_2 - \beta H_2 \\
&= 6H_2 n_1 + 4H_2 n_o - 2\beta H_2 + 2(H_1 - q_R).
\end{aligned}$$

We can rewrite them as

$$\frac{\partial^2\pi}{\partial n_o^2} = 2(q-q_R), \quad \frac{\partial^2\pi}{\partial n_1^2} = 2\frac{\partial^2\pi}{\partial n_o \partial n_1} - 2(q-q_R),$$

$$\frac{\partial^2\pi}{\partial n_o \partial n_1} = -\beta H_2 + 2H_2(n_0+n_1) + 2(q-q_R).$$

The determinant of the hessian $|H|$ is

$$\frac{\partial^2\pi}{\partial n_1^2} * \frac{\partial^2\pi}{\partial n_o^2} - \left(\frac{\partial^2\pi}{\partial n_o \partial n_1}\right)^2 = 2(q-q_R) * (2 * \frac{\partial^2\pi}{\partial n_o \partial n_1} - 2(q-q_R)) - \left(\frac{\partial^2\pi}{\partial n_o \partial n_1}\right)^2$$

$$= 4(q-q_R)\frac{\partial^2\pi}{\partial n_o \partial n_1} - 4(q-q_R)^2 - \left(\frac{\partial^2\pi}{\partial n_o \partial n_1}\right)^2 = -(2(q-q_R) - \left(\frac{\partial^2\pi}{\partial n_o \partial n_1}\right))^2 < 0$$

Since the determinant of the Hessian is smaller than zero, the interior solution can be neither a maximum nor a minimum, since they both require the determinant to be positive. Thus, when $n_0+n_1 < n$ interior solutions are neither a maximum nor a minimum. Therefore, the optimal solution to the TO problem is either $\{n_0 > 0, n_1 = 0\}$ or $\{n_0 = 0, n_1 > 0\}$.

Now we examine the case in which the constraint is binding, that is, $n_0 + n_1 = n$. To do so we solve the TO problem imposing that the constraint is binding, and by substituting the constraint ($n_0 = n - n_1$) into the objective function of the TO, its profit function becomes:

$$\pi_B = [p_R - (q_R - H_1 - n_1 H_2) \cdot n - \mu + \beta (H_1 + n_1 H_2)] \cdot n - c \cdot n_1.$$

The derivative of π_B with respect to n_1 is

$$\frac{\partial \pi_B}{\partial n_1} = n^2 \cdot H_2 - \beta H_2 \cdot n - c.$$

Doing some algebra we find that this is positive for all $n > \beta + \frac{c}{(1-\alpha)\Delta}$ and negative for all $n < \beta + \frac{c}{(1-\alpha)\Delta}$.

Hence, for any given n (except for the trivial case when $n = \beta + \frac{c}{(1-\alpha)\Delta}$), the derivative is either always positive or negative. Therefore, the solution to the problem is either all upgrading or non upgrading; i.e. either $\{n_0 = n, n_1 = 0\}$ or $\{n_0 = 0, n_1 = n\}$.

■

Proof. of lemma2.

Notice that from lemma 1, the TO requires upgrading from all the hotels he contracts with (n_1^{TO}) or from none (n_0^{TO}). We have to consider several possibilities depending on whether the constraint ($n = n_0 + n_1$) is binding or not.

First part, step 1. $n_0^{TO} = \widehat{n}_0$ is a local optimum when the following is satisfied:

$$i)\ \frac{\partial \pi}{\partial n_0}|_{(n_1=0,\widehat{n}_0)} = 0; \quad ii)\ \frac{\partial \pi}{\partial n_1}|_{(n_1=0,\widehat{n}_0)} < 0;$$

$$iii)\ \frac{\partial \pi^2}{\partial n_0^2}|_{(n_1=0,\widehat{n}_0)} < 0; \quad iv)\ \widehat{n}_0 < n.$$

What is $\widehat{n}_0$ **?** In order to verify the condition $i)$, substitute $n_1 = 0$ and solve for n_0. This yields $\widehat{n}_o = \frac{p_R - \mu - \beta H_1}{2(q_R - H_1)}$, which is well defined since we assume that both the numerator and the denominator are positive. (This means that the reservation price of the market to which the monopolist sells is high enough, so that the monopolist can extract a surplus by selling to the hotel at the outside option value; and the denominator is assumed in our presentation of the model)

Given that $\left.\frac{\partial^2 \pi}{\partial n_o^2}\right|_{n_1=0} = 2H_1 - 2q_R$, condition $iii)$ satisfies since $(q_R - H_1) > 0$ has been assumed above.

In order to verify condition $ii)$, notice that (from lemma 1)

$$\frac{\partial \pi}{\partial n_1}|_{(n_1=0,\widehat{n}_0)} = \frac{\partial \pi}{\partial n_0}|_{(n_1=0,\widehat{n}_0)} + \widehat{n}_0^2 H_2 - \beta H_2 \widehat{n}_0 - c$$

and $\frac{\partial \pi}{\partial n_o}|_{(n_1=0,\widehat{n}_0)} = 0$ due to the calculus above, thus,

$$\frac{\partial \pi}{\partial n_1}|_{(n1=0,\widehat{n0})} = \widehat{n}_0^2 H_2 - \beta H_2 \widehat{n}_0 - c.$$

In order to guarantee condition (ii), we need that $\widehat{n}_0^2 H_2 - \beta H_2 \widehat{n}_0 - c < 0$, which is true when

$$\widehat{n}_0 < \frac{\beta}{2} + \left(\frac{\beta^2}{4} + \frac{c \cdot n}{(1-\alpha)\,\Delta} \right)^{\frac{1}{2}}.$$

Hence, for large enough n (since then conditions (ii) and (iv) hold), $\widehat{n}_0$ is a local optimum.

First part, step 2. $n_0^{TO} = n$ is a local optimum when

$$\widehat{n}_0 > n, \quad \text{and} \quad \frac{\partial \pi_B}{\partial n_1} = n^2 \cdot H_2 - \beta H_2 \cdot n - c < 0.$$

The second condition ensures that $n_1 = 0$, and holds when $n < \frac{\beta}{2} + \left(\frac{\beta^2}{4} + \frac{c \cdot n}{(1-\alpha)\Delta} \right)^{\frac{1}{2}}$. Consequently, both conditions holds when $n < \widehat{n}_0$ and $n < \frac{\beta}{2} + \left(\frac{\beta^2}{4} + \frac{c \cdot n}{(1-\alpha)\Delta} \right)^{\frac{1}{2}}$. Hence for small enough n, $n_0^{TO} = n$ is a local optimum.

Therefore, from step 1 and step 2, $n_0^{TO} = \min[n, \widehat{n}_0]$ is a local optimum when $n_0^{TO} < \frac{\beta}{2} + \left(\frac{\beta^2}{4} + \frac{c \cdot n}{(1-\alpha)\Delta} \right)^{\frac{1}{2}}$.

Let's now prove the second part of the lemma.

Second part, step 1. $n_1^{TO} = \widehat{n}_1$ is a local optimum when

$$\begin{aligned} i)\ \frac{\partial \pi}{\partial n_1}|_{(n_0=0,\widehat{n}_1)} &= 0; \quad ii)\ \frac{\partial \pi^2}{\partial n_1^2}|_{(n_0=0,\widehat{n}_1)} < 0; \\ iii)\ \frac{\partial \pi}{\partial n_o}|_{(n_0=0,\widehat{n}_1)} &< 0; \quad iv)\ \widehat{n}_1 < n. \end{aligned}$$

Condition (i) is:

$$\frac{\partial \pi}{\partial n_1}|_{(n_0=0,\widehat{n}_1)} = 3H_2(\widehat{n}_1)^2 + 2(H_1 - q_R - \beta H_2)\widehat{n}_1 + p_R - \mu - \beta H_1 - c = 0$$

This equation has two solutions:

$$\widehat{n}_{1+}; \widehat{n}_{1-} = \frac{2(q_R+\beta H_2-H_1) \pm \sqrt{(2(q_R+\beta H_2-H_1))^2+12H_2(-p_R+\mu+\beta H_1+c)}}{6H_2}.$$

Assuming that $p_R - c - (\mu + \beta H_1) > 0$ (the reservation price is big enough so that the monopolist can have a surplus by paying to the hotel the outside option when $n_1 = 0$ and the cost of upgrading, i.e., $p_R - y_1 > 0$) both solutions are positive. However, we will show that only $\widehat{n}_{1-}$ condition (ii), while $\widehat{n}_{1+}$ does not. In order that a given $\widehat{n}_1$ satisfies condition (ii), it must be that

$$\widehat{n}_1 < \frac{2(q_R+\beta H_2-H_1)}{6H_2}.$$

It is immediate to see that

$$\widehat{n}_{1-} < \frac{2(q_R+\beta H_2-H_1)}{6H_2} < \widehat{n}_{1+}.$$

Therefore, we set $\widehat{n}_1 = \widehat{n}_{1-}$.

Now we must study when $\widehat{n}_1$ verifies condition (iii). We can write:

$$\frac{\partial \pi}{\partial n_0}|_{(n_0=0,\widehat{n}_1)} = \frac{\partial \pi}{\partial n_1}|_{(n_0=0,\widehat{n}_1)} - (H_2\widehat{n}_1^2 - \beta H_2\widehat{n}_1 - c).$$

Due to condition (i), the first part of the right hand side is zero, so we must guarantee that the second part is negative, that is, the expression within brackets is positive. This will be verified when

$$\widehat{n}_1 > \widetilde{n} \equiv \frac{\beta H_2+\sqrt{(\beta H_2)^2+4H_2c}}{2H_2} = \frac{\beta}{2} + \sqrt{\left(\frac{\beta}{2}\right)^2 + \frac{c\cdot n}{(1-\alpha)\Delta}}.$$

Second part, step 2. $n_1^{TO} = n$ is a local optimum when $n < \widehat{n}_1$ and $\frac{\partial \pi_B}{\partial n_1} > 0$, that is, when $n > \widetilde{n}$.

Then, from step 1 and 2, it is straightforward to see that the second part of the lemma verifies. ■

Proof. of proposition 1.

¿From lemma 1, if the TO contracts with all HOWs there are two possible local optima: $\left\{n_0^{TO} = n, n_1^{TO} = 0\right\}$ and $\left\{n_0^{TO} = 0, n_1^{TO} = n\right\}$.

¿From lemma 2, if $n > \widetilde{n}$, that is, $n > \beta + \frac{c}{(1-\alpha)\Delta}$, then $\left\{n_0^{TO} = n, n_1^{TO} = 0\right\}$ cannot be an optimal solution, while $\left\{n_0^{TO} = 0, n_1^{TO} = n\right\}$ satisfies the conditions for a local optimum. Therefore, it is the optimal solution.

The proof goes analogous for the inverse. ■

Proof. of proposition 2 (1).

In order to prove this proposition we need to prove that $\widehat{n}_1$ is a local optimum (step 1) and that $\widehat{n}_0$ is not a local optimum (step 2), for n 'neither too large nor too small', and provided that β and c are not too large.

Step 1. According to lemma 2, for $\widehat{n}_1$ to be a local optimum it must be that $\widehat{n}_1 > \widetilde{n}$. First take $c = 0$. Then, $\widehat{n}_1 > \widetilde{n}$ when:

$$\frac{2(q_R - H_1 + \beta H_2) - \sqrt{(2(q_R - H_1 + \beta H_2))^2 + 12H_2(-p_R + \mu + \beta H_1)}}{6H_2} > \frac{\beta H_2 + \sqrt{(\beta H_2)^2}}{2H_2},$$
$$q_R - H_1 - 2 * \beta H_2 > \sqrt{(q_R - H_1 + \beta H_2)^2 + 3H_2(-p_R + \mu + \beta H_1)}.$$

If $(q_R - H_1 - 2 * \beta H_2) > 0$, (it is clear that if it were negative the condition would not be satisfied) that is $n > \frac{2\beta(1-\alpha)\Delta}{q_r - H_1}$, squaring the two terms we obtain

$$(q_R - H_1 - 2 * \beta H_2)^2 > (q_R - H_1 + \beta H_2)^2 + 3H_2(-p_R + \mu + \beta H_1).$$

Doing some more algebra, we obtain that this is satisfied if and only if $\beta^2 H_2 + (p_R - \mu - \beta(2q_r - H_1)) > 0$ and $n > \frac{2\beta(1-\alpha)\Delta}{q_r - H_1}$. A sufficient condition for this is

$$\beta < \frac{p_R - \mu}{(2q_r - H_1)} \text{ and } n > \frac{2\beta(1-\alpha)\Delta}{q_r - H_1}.$$

Now, we examine the derivatives of $\widehat{n}_1$ and $\widetilde{n}$ with respect to c:

$$\frac{\partial \widetilde{n}}{\partial c} = \frac{\partial\left(\frac{\beta H_2 + \sqrt{(\beta H_2)^2 + 4H_2 c}}{2H_2}\right)}{\partial c} = \sqrt{(\beta H_2)^2 + 4H_2 c} > 0,$$
$$\frac{\partial \widehat{n}_1}{\partial c} = -\sqrt{(2(q_R - H_1 + \beta H_2))^2 + 12H_2(-p_R + \mu + \beta H_1 + c)} < 0.$$

Therefore, there exists $c^* > 0$ such that for $0 < c < c^*$ and above conditions, the condition $\widehat{n}_1 > \widetilde{n}$ is satisfied. Thus, $\widehat{n}_1$ is a local optimum.

Step 2. We want to show that, for some parameter constellations, $\widehat{n}_0$ is not a local optimum. $\widehat{n}_0$ is not a local optimum if $\widehat{n}_0 > \widetilde{n}$, that is, if $\frac{p_R - \mu - \beta H_1}{2(q_R - H_1)} > \frac{\beta}{2} + \left(\frac{\beta^2}{4} + \frac{c \cdot n}{(1-\alpha)\Delta}\right)^{\frac{1}{2}}$. For $c = 0$, this condition is true if and only if $\beta < \frac{p_R - \mu}{(2q_r - H_1)}$. Hence, for $c = 0$ and $\beta < \frac{p_R - \mu}{(2q_r - H_1)}$ this condition does hold and $\widehat{n}_0$ is not a local optimum. Finally notice, that for given β and c , n cannot be too large, otherwise above condition would not hold.

Since step 1 and step 2 have been proven, QED. ■

Proof. of proposition 2 (2)

In order to have quality upgrading as a local optimum, we need: $\widehat{n}_1 > \widetilde{n}$, that is (setting $H_1 = 0$ simply for ease of exposition):

$$\frac{2(q_R+\beta H_2)-\sqrt{(2(q_R+\beta H_2))^2+12H_2(-p_R+\mu+c)}}{6H_2} > \frac{\beta H_2+\sqrt{(\beta H_2)^2+4H_2 c}}{2H_2},$$

$$2q_R > \beta H_2 + 2\sqrt{(q_R+\beta H_2)^2 + 3H_2(-p_R+\mu+c)} + 3\sqrt{(\beta H_2)^2 + 4H_2 c}.$$

Take $\beta = 0$ and $c > 0$. Then,

$$\begin{aligned} 2q_R &> 2\sqrt{(q_R)^2 + 3H_2(-p_R+\mu+c)} + 6\sqrt{H_2 c}, \\ q_R - \sqrt{9H_2 c} &> \sqrt{(q_R)^2 + 3H_2 c + 3H_2(-p_R+\mu)}. \end{aligned}$$

Assuming that $q_R - \sqrt{9H_2 c} > 0$ (if it were negative, the condition does not hold), we obtain

$$\sqrt{H_2} > \frac{2q_R\sqrt{c}}{2c+p_R-\mu}.$$

This holds for n small, since then $H_2 = \frac{(1-\alpha)\Delta}{n}$ is large. Thus, for $\beta = 0$ and $c > 0$, necessary and sufficient conditions for quality upgrading to be an optimum are $\sqrt{H_2} > \frac{2q_R\sqrt{c}}{2c+p_R-\mu}$ and $\frac{(q_R)^2}{9c} > H_2$. That is, $\left(\frac{2q_R\sqrt{c}}{2c+p_R-\mu}\right)^2 < H_2 < \frac{(q_R)^2}{9c}$. [This is possible as long as $\left(\frac{2q_R\sqrt{c}}{2c+p_R-\mu}\right)^2 < \frac{(q_R)^2}{9c}$, that is, $\frac{4c}{(2c+p_R-\mu)^2} < \frac{1}{9c}$.]

So we have shown that for $\beta = 0$, and $c > 0$ upgrading is not an optimum for n large. Then for $\beta > 0$, if for a given n it was not an equilibrium, then it will neither be an equilibrium, since it simply adds $\beta H_2 > 0$ to the RHS of the equation/condition. ■

Proof. of Proposition 4.

The ICTO $\max\limits_{(n_{TO},n_U)} \pi = p \cdot n_{TO} + (n - n_{TO}) \cdot E - c \cdot n_U$. The derivatives are

$$\begin{aligned} \frac{\partial \pi}{\partial n_U} &= n_{TO} \cdot \frac{(1-\alpha)\Delta}{n}(n_{TO} - \beta) + \beta(1-\alpha)\Delta - c, \\ \frac{\partial \pi}{\partial n_{TO}} &= p - E - (q_R - q) \cdot n_{TO}. \end{aligned}$$

Notice that the first derivative does not depend on n_U, given a value of n_{TO}. Thus, $\frac{\partial \pi}{\partial n_U}$ is positive or negative depending on the value of n_{TO}. Hence there are only two possible solutions. For those n_{TO} such that $\frac{\partial \pi}{\partial n_U} > 0$, $n_U = n$; whereas for those n_{TO} such that $\frac{\partial \pi}{\partial n_U} < 0$, $n_U = 0$. First point of the proposition has been shown.

For a given n_{TO}, according to lemma 2, for the monopolist TO to request upgrading it is necessary that $n_{TO} > \frac{\beta}{2} + \left(\left(\frac{\beta}{2}\right)^2 + \frac{c \cdot n}{(1-\alpha)\Delta}\right)^{\frac{1}{2}}$. In the case of the ICTO, in order to have $\frac{\partial\pi}{\partial n_U}$ positive, it is enough that $n_{TO} > \frac{\beta}{2} + \left(\left(\frac{\beta}{2}\right)^2 + \frac{(c-\beta(1-\alpha)\Delta)\cdot n}{(1-\alpha)\Delta}\right)^{\frac{1}{2}}$. Hence, the second point of the proposition has been shown.

In order to prove the third point of the proposition, assume that $c < \beta(1-\alpha)\Delta$. Furthermore, notice that as long as there is upgrading ($n_U = n$), $n_{TO} = \frac{p_R - \mu - \beta q}{2(q_r - q)}$ does not vary with n. Hence if for a given n we have upgrading, that is, $\frac{\partial\pi}{\partial n_U} > 0$, increases in n do not change the sign of the derivative; and therefore quality upgrading will still take place. ■

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