

## EXPANSION OF A HOTEL CHAIN AND ENVIRONMENTAL QUALITY

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*In this paper we analyze in which way the expansion strategy of a hotel chain is influenced by the environmental quality of both the domestic and the foreign region. We show that the environment (which is a public good, and determines the competitive advantage of hotels in a region) plays a double role in shaping the strategy of the chain. Thus, a chain will expand internationally when the combined environmental potential of the two regions is large enough. Or, alternatively, for a home region with a medium-low environmental potential, the chain will expand internationally when the foreign region has a high enough potential in environmental quality.*

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### 1. Introduction

The aim of this paper is to study the expansion strategy of hotel chains and, more precisely, the role played by environmental quality in the choice of a chain between a local and an international expansion. Thus, we study in which ways does the environmental quality of the home and the foreign region affect the incentives that a hotel chain has to go international as opposed to expand locally. This is, we believe, an important issue because of, on the one hand, the increasing presence of (international) hotel chains in the lodging industry and, on the other hand, the crucial role of the environment in the tourism industry.

Whereas in some countries like the US, the presence of hotel chains in the lodging industry is already very large (over 70% of the hotels are part of a chain), in some other countries their importance is smaller,

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but growing: e.g. in Spain, hotel chains account for a 27.02% of all hotels in the country in 1999, from a 17.08% only 4 years before (Annual Report of the Spanish Hotel Chains Association, 1999). Along these lines, another important feature of the hotel industry is their increasing international exposure, as occurs for example in Spain (Urtasun, 2001). The Corporation Sol-Melia has, in various forms of control, a 49% of its hotel establishments outside Spain; and over 66% of hotel establishments controlled by Barceló are outside Spain, as examples of two of the most important Spanish hotel chains (Credit Suisse First Boston, 2000).

Our focus lies on the impact of the environment in the expansion strategy of a chain because the environment is one of the main inputs of the tourism product (and even more so everyday). The Economist Intelligence Unit Report (Bywater, 1992) states that the demand side in the tourism industry is becoming more aware about environmental quality, even if the pace may vary across consumer segments and countries. 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 establish "the importance of the environment among the attributes of holiday destinations. It was found that potential overseas tourists were willing to pay a substantial premium to visit a destination with a high level of environmental quality."

Our analysis emphasizes two features of environmental quality. One is the presence of quality externalities among hotel establishments in the provision of environmental quality. Indeed, a distinguishing feature of the hotel industry 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. Then, to the extent that the environment is a public good, the agents in the tourism sector may suffer the tragedy of the commons (Baumol and Oates, 1988; Briassoulis, 2002); namely, they may have less incentives than socially optimal to invest in the maintenance of the (natural and non natural) environment. In this context, then, a local chain may have a higher incentive to invest in the environmental quality of the region since it internalizes a larger share of its return.

The other feature we emphasize of the natural and non natural environment is that it is one of the main factors providing a competitive advantage at an international level to any hotel establishment. There-

fore, an international presence reduces for a hotel chain the importance of the natural environment of a specific region. Even more, for an international chain to invest in a given natural environment reduces the attractiveness of other tourist regions where the hotel chain is present. Then, this implies that the incentives of a hotel establishment belonging to an international chain to invest in environmental quality will be lower than those of an establishment not belonging to an international chain. These two features of environmental quality and its implications concerning quality investments by a chain (both discussed and analyzed in Calveras, 2003) are the main drivers of the expansion strategy of the chain, which we study in the main section of the paper, Section 4.

In Section 4, then, we analyze the expansion decision of a hotel chain, that is, its incentives to go international as opposed to expand locally. We undertake the analysis in a world with three establishments, and two (vertically and horizontally differentiated) regions, following the cooperative merger formation proposed by Horn and Persson (2001a, 2001b). Such a cooperative approach is very well suited to our set-up since they endogenize mergers (for us, chain formation) taking into account the effects of such mergers on the firms left-out; that is, incorporating the fact that mergers have externalities on the agents left out. To their analysis we mainly incorporate the environment and its characteristics as explained above. This means that, in our framework, as opposed to theirs, a better environment increases demand in each region, and also that demand is not necessarily segmented, namely, that regions may compete in attracting consumers (tourists).

Our analysis shows that the environment plays a double role in shaping the growth strategy of the chain. On the one hand, a local expansion will have the effect of reducing the free-riding in the provision of the environmental quality in the home region of the chain. On the other hand, an international expansion will reduce the incentives of the establishments that will belong to the resulting international chain to invest in environmental quality. As a consequence, competition between regions will decrease. Thus, a chain expansion has one of two possible strategic effects, depending on whether it is a local or an international expansion. That effect which is potentially largest will be the driver of the strategy followed by the chain. We find, intuitively, that an international expansion will take place in equilibrium when the potential competition between the two regions is largest. Such poten-

tial competition is largest when the potential environmental quality of both the home and the foreign region are large. Otherwise, a local expansion (which reduces free-riding in the provision of environmental quality) will take place. Hence, one corollary to this main result of the paper is that a hotel establishment will expand internationally when the foreign region has a large enough potential environmental quality.

Then, in the remaining sections of the paper, we analyze two other issues. In Section 5, we encompass within our model the strategy followed these last 10 or 15 years by some of the major hotel chains of the Balearic Islands (such as Sol-Melià and Barceló): disinvesting in the Balearic Islands (by selling off establishments), while undertaking a very important international expansion. We show that such a strategy can be explained within the parameters of our model. Finally, in Section 6, we incorporate in our analysis another important issue of the lodging industry: the fact that the expansion of hotel chains throughout the world is undertaken by means of a rich variety of contractual forms, including not only direct ownership, but also management contracts or franchises. Thus, in this last Section 6 of the paper, we discuss the mode of expansion (direct ownership vs. management contracts) and its relation to the geographic scope of the expansion.

### *1.1 Related literature*

In spite of its importance in the world economy, the tourism industry has been studied very little by the economic literature, whether empirically or theoretically. There is even less economic analysis of the hotel industry and, more specifically, of the formation of hotel chains, whether national or multinationals. To approach the analysis of the multinational hotel chain in our paper we follow the eclectic approach to multinational enterprise (MNE) theory (Dunning, 1977; see also Caves, 1996, for an extensive review of the economic analysis of multinational enterprises).

Since undertaking production in a foreign country has important costs (e.g. cultural differences, hiring and training employees in the host country, etc.), there must be some advantage for firms to engage in multinationalization. Several advantages were first identified in the eclectic approach: ownership, location and internalization advantages. As I said, within the eclectic and economic approach, the literature on the international hotel chains is scarce, among which we can find the analysis undertaken by Dunning and McQueen (1981, 1982). They

present the results of a survey carried out by the authors in 1980 on the size, distribution and forms of involvement of MNEs in the hotel industry. They revise the eclectic theory within the framework of multinational hotel chains, and show that all of the three main reasons for multinationalization can apply: ownership (prestigious chains seek to capitalize on their brand images, which provide clear impressions of the quality and the range of services offered), location and internalization.

The management literature has discussed a bit international hotel chains; however, it deals on issues other than expansion of hotel chains and the environment. Their focus has been on issues like the entry mode in a new market, an issue which we discuss in section 6 (see, for instance, Brown *et al.*, 2003). The literature on tourism studies has also studied both the importance and the role of the environment in the tourism industry (see, for instance, Butler, 2000; and Alavalapati and Adamowicz, 2000), and international hotel chains. Some papers, for example, review the motivation and the impact of foreign direct investment in the international hotel industry (Dwyer and Forsyth, 1994; Zhao and Olsen, 1997). Interestingly, some other papers argue, although vaguely and without a clear explanation, that large scale, foreign-owned, enclave-type resorts have been associated with environmental destruction (Kusluvan and Karamustafa, 2001; Brohman, 1996).

Next, we present the model. Then, moving backwards, in Section 3 we analyze environmental investments in stage 2, taking as given the organizational form. Then, in Section 4 (the main section of the paper) we analyze chain formation. Finally, in Sections 5 and 6 we discuss some extensions to the basic framework, and we conclude in Section 7. All proofs are provided in the appendix.

## 2. The model

The model includes two tourist regions, three hotel establishments, and two tour operators. It is a model of horizontal differentiation à la Hotelling (determined by the location of hotel establishments in either region) and of vertical differentiation (determined by the environmental quality of the region in which the hotel is located). In the world there are two tourist regions, *A* and *B*. Each region is located at the end of a line of distance 1: region *A* at the left end and region *B* at the right end. World tourists are uniformly distributed along the line.

In region  $A$  there are 2 hotel establishments (denoted 1 and 2) and in region  $B$  there is one hotel establishment (denoted 3). Each hotel establishment can possibly belong to an international chain (which consists of one hotel establishment in each region) or a local chain (which consists of two hotel establishments in only one of the regions; thus, there can only be a local chain in region  $A$ ), or to no hotel chain. Each hotel establishment can invest in quality.

Because of its importance, we focus the analysis on environmental quality, abstracting from hotel idiosyncratic quality. There is ample evidence of the importance of the environment in the tourist sector. In this view, The Economist Intelligence Unit Special Report (Bywater, 1992) stresses that “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.” By focusing in the environmental quality, quality externalities among hotel establishments must be an essential building block in the analysis. 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, maybe 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 hotel establishments are a key factor to understand the industry.

The presence of these externalities creates a common’s problem: quality is jointly produced by all hotel establishments in the region. In consequence, quality will tend to be underprovided in our setting. To emphasize the presence of quality externalities among producers, we make the assumption that the quality of a hotel is the quality of the region in which it is located, disregarding the possibility that hotel establishments within a region differentiate among themselves. Thus, the quality of region  $R$  (and of all hotel establishments within) is jointly determined by the environmental quality of all hotel establishments in the region (in a way specified below). We abstract from hotel differentiation within a region so as to focus our analysis in environmental quality.

We now proceed to present the model in a more detailed manner. We take as given exogenously the number of hotel establishments in each region all along the analysis: as we said, there are 2 hotel establishments in region  $A$  (1 and 2), and one hotel establishment in region  $B$  (establishment 3) of exogenous (non-binding) capacity  $k$ . The model has the following stages.

STAGE 1. International and/or local hotel chains are created by grouping together several hotel establishments. We explain and analyze chain formation in detail in section 4 below.

STAGE 2. Each hotel establishment  $i \in \{1, 2, 3\}$ , whether in region  $A$  or region  $B$ , (whether part of an international chain or not) invests  $Q_i \geq 0$  in environmental quality, at a cost  $c(Q_i)$ , where we will take for simplicity that  $c(Q_i) = \frac{c}{2}Q_i^2$ , where it is easy to see that  $c'(Q_i) > 0$ ,  $c''(Q_i) > 0$ , and  $c'(0) = 0$ . Quality of each region (and consequently the quality of each hotel establishment in the region) is determined by the investments of all hotels in that region. That is, in general, the quality of region  $R$  (and of each of the hotel establishments within) is

$$q_R = \frac{\alpha_R}{n_R} \sum_{i \in R} Q_i. \quad [1]$$

The quality  $q_R$  is determined by the amount of investments undertaken by all hotel establishments in the region  $\sum_{i \in R} Q_i$ , multiplied by a region idiosyncratic parameter  $\alpha_R$ , and all this normalized by the number of establishments  $n_R$  present in the region.  $\alpha_R$  is to represent that, in a given time, the environmental potential of a region is exogenously given, say by natural or non-natural conditions. Our specification of environmental quality specification captures the public good character of the environmental quality whereby the overall provision is determined by everybody's contribution. Specifically then, we have that  $q_A = \frac{\alpha_A}{2}(Q_1 + Q_2)$  and  $q_B = \alpha_B Q_3$ .<sup>1</sup>

<sup>1</sup>Alternative specifications of the regional quality are possible, such as  $q_R = \alpha_R \sum_{i \in R} Q_i$ , which also incorporates the public good characteristic of environmental quality. The specification we use in the text, however, additionally implies that having a new hotel establishment in the region that either does not invest or invests less than what the other establishments do, decreases the environmental quality of the region. This, which we believe to be intuitive, would not appear in this alternative specification. Overall, however, the results of our paper would not be changed since they rely upon the public good characteristic of the environment.

STAGE 3. Hotel establishments in regions  $A$  and  $B$  distribute their capacities through tour operators  $TO_A$  and  $TO_B$ , respectively. The TO and hotel establishments in each region bargain and agree to share the net operative profits  $\pi$  of tourism accommodation: the TO keeps  $(1 - \delta) \cdot \pi$  while the hotel gets  $\delta \cdot \pi$ . We assume that the variable costs of tourism accommodation (incurred by hotel establishments) and variable costs of distribution (incurred by TO) are zero. Hence, net profits  $\pi$  is simply income, that is, the price paid by tourists times the number of tourists. Since all hotel establishments are alike, prices are the same for all hotels in a region. Furthermore, in case there is excess capacity, hotel establishments share equally all visitors. Each tour operator  $TO_R$  sets price  $p_R$  to maximize his profits  $(1 - \delta) \cdot \pi$ , taking as given the price set by the other TO. Hence we will derive the Nash equilibrium on prices.<sup>2</sup> (We will assume all along for simplicity that TO and hotel establishments have equal bargaining power and thus  $\delta = \frac{1}{2}$ .)

STAGE 4. Tourists are uniformly distributed along the world line of distance 1. They have a unit distance cost of transportation  $\tau$ . That is, for a tourist located at  $x$ , going on vacation to region  $A$  implies a transportation cost of  $\tau x$ , whereas going to region  $B$  implies a cost of  $\tau(1 - x)$ . The utility of a tourist located at point  $x$  of going to region  $R$  of quality  $q_R$  and price  $p_R$  is

$$u(x, R) = r + q_R - p_R - \tau d(x, R), \quad [2]$$

<sup>2</sup>The literature on the industrial organization of the tour operator package industry is not conclusive with regard to its market structure. Some work presents evidence of tour operators enjoying some market power (Baum and Mudambi, 1994), whereas other papers describe the TO package industry as best described as a contestable market, whereby the market power of TO is rather small (Sheldon, 1986). In between there is Graton and Richards (1997) describing the UK TO industry as a contestable market, and the German TO industry as a stable oligopoly. We model the TO industry in a reduced way (that allows to capture both possibilities) by assuming there is a single TO in each region that enjoys some exogenous bargaining power with the hotel owners described by  $1 - \delta$ .  $\delta$  would range from 0 to 1, with  $\delta$  near 1 representing the assumption of a contestable market, whereas a  $\delta$  closer to 0 would represent a TO industry with market power. The role played by a TO is rather passive in our model: it simply distributes the offer in the region it is located at the price that maximizes its profits. (Notice that this price is independent of the actual value of  $\delta$ , and it is the price that the owners of hotel establishments would set if they colluded to maximize regions profits). The strategic role played by tour operators in the determination of quality is studied in Calveras and Vera-Hernandez (2005), where TOs do play an active role in the determination of the number of rooms they distribute, and in the final quality supplied by hotel establishments in a single region.

where  $r$  is the fix utility gain of a tourist from going on vacation, wherever the destination chosen (we assume for the moment that  $r$  is large enough so that the tourist always goes on vacation); and where  $d(x, R) \in \{x, (1 - x)\}$  is the distance between  $x$  and  $R$ . A tourist may also choose not to go on vacation, in which case his/her utility is 0. Then, given  $r$ , given their location, given the prices determined by the TO, and given the environmental quality of each region, the tourists decide whether to go on vacation and, if so, whether to go to region  $A$  or  $B$ .

### 3. Environmental quality

In this section we analyze the incentives of hotel establishments to invest in environmental quality taking as given whether they are part of a hotel chain or not, and we obtain the resulting environmental quality of each region.<sup>3</sup> The results of this section will be the main drivers of chain formation, studied in Section 4. Now, we proceed backwards, first deriving tourism demand, then the pricing behavior of tour operators, and finally quality investments by establishments.

#### 3.1 Stage 4

In the fourth stage, tourists decide whether, and where, to go on vacation. The following lemma characterizes tourism demand.

LEMMA 1 (*Tourism demand*). *Given qualities  $q_A$  and  $q_B$  and prices  $p_A$  and  $p_B$ , tourism demand  $D_A$  and  $D_B$  faced, respectively, by regions  $A$  and  $B$  are  $D_A = \frac{(q_A - q_B) - (p_A - p_B) + \tau}{2\tau}$ , and  $D_B = \frac{(q_B - q_A) - (p_B - p_A) + \tau}{2\tau}$ .*

All proofs are in Appendix A2.

It is intuitive that whenever  $r$  (the fix utility gain to a tourist from going on vacation) is *large enough*, all tourists will go on vacation. In this case, tourism demand faced by each region depends on relative quality and prices: there is competition to attract tourists.

#### 3.2 Stage 3

Each tour operator ( $TO_A$  and  $TO_B$ ) distributes the capacity of one region. The price for each hotel establishment in a given region  $R$  is the same since they all exhibit the same quality  $q_R$ . Thus, each TO sets

<sup>3</sup>This section draws from the analysis in Calveras (2003), except for the results stated in Proposition 1.

the price to maximize his profits, taking into account that his profits are a  $(1 - \delta)$  portion of the net profits of the region. Hence, assuming there exists no capacity constraint in accommodation,  $TO_A \max_{p_A} (1 - \delta) p_A D_A$ , and  $TO_B \max_{p_B} (1 - \delta) p_B D_B$ . Recall that  $(1 - \delta)$  represents the bargaining power enjoyed by the TO in front of the hotel establishment, and that we assumed that  $\delta = \frac{1}{2}$ . Thus, the following lemma characterizes the prices set by each tour operator in each region.

LEMMA 2 (*Tour operator pricing*). *Given qualities of regions A and region B, the prices set by tour operators A and B are  $p_A = \tau + \frac{1}{3}(q_A - q_B)$ ,  $p_B = +\frac{1}{3}(q_B - q_A)$ .*

Notice that, given that regions A and B compete in attracting tourists, prices set by the tour operators depend on relative qualities of the regions.

### 3.3 Stage 2

In the second stage, each hotel establishment can invest in environmental quality, whether it belongs to (an international or local) chain or not. As we said, there are two hotel establishments (1 and 2) in region A and one hotel establishment (denoted by 3) in region B. Then, an international chain is made up of a hotel establishment in region A and another one in region B (this means an international chain may be a configuration of establishments 1 and 3; or establishments 2 and 3); whereas a local hotel chain is made up of two hotel establishments in the same region, namely region A (which means that a local chain is made-up of establishments 1 and 2). Next we derive the incentives of a hotel establishment to invest in each of the possible organizational scenarios.

To begin with, take a hotel establishment  $i \in \{1, 2\}$  in region A that does not belong to any hotel chain. Then this hotel establishment  $i$   $\max_{Q_i} \pi_i^N$  where  $\pi_i^N = \frac{1}{2} p_A \frac{D_A}{2} - c(Q_i)$ , where recall that  $c(Q_i) = \frac{c}{2} Q_i^2$  throughout the analysis. Notice that  $\frac{D_A}{2}$  is the part of tourism demand in region A that this establishment captures. First order condition is

$$\frac{1}{4} \left( \frac{\partial p_A}{\partial Q_i} D_A + \frac{\partial D_A}{\partial Q_{Ai}} p_A \right) = c'(Q_i). \tag{3}$$

On the other hand, take a *local hotel chain* in region A made up of hotel establishments 1 and 2. The local chain chooses environmental

investments in each establishment in order to maximize the profits of the whole chain:  $\max_{(Q_1, Q_2)} \pi_{12}^L$ , where  $\pi_{12}^L = \frac{1}{2} \left( p_A \frac{D_A}{2} + p_A \frac{D_A}{2} \right) - c(Q_1) - c(Q_2)$ . Then, first order condition with respect to  $Q_i$ , with  $i \in \{1, 2\}$ , is (and analogously with respect to  $Q_j$ )

$$\frac{1}{2} \left( \frac{\partial p_A}{\partial Q_i} D_A + \frac{\partial D_A}{\partial Q_i} p_A \right) = c'(Q_i). \quad [4]$$

Finally, the investment undertaken by an *international chain* made up of a hotel establishment  $i \in \{1, 2\}$  in region  $A$  and establishment 3 in region  $B$ , is determined by  $\max_{(Q_i, Q_3)} \pi_{i3}^I$ , where  $\pi_{i3}^I = \frac{1}{2} \left( p_A \frac{D_A}{2} + p_B D_B \right) - c(Q_i) - c(Q_3)$ . FOC with respect to  $Q_i$  is

$$\frac{1}{4} \left( \frac{\partial p_A}{\partial Q_i} D_A + \frac{\partial D_A}{\partial Q_i} p_A \right) + \frac{1}{2} \left( \frac{\partial p_B}{\partial Q_i} D_B + \frac{\partial D_B}{\partial Q_i} p_B \right) = c'(Q_i). \quad [5]$$

Given that (for the moment) we are assuming that regions do compete ( $r$  is large enough), it is clear that  $\left( \frac{\partial p_B}{\partial Q_i} D_B + \frac{\partial D_B}{\partial Q_i} p_B \right) < 0$ . This is so because an investment in quality  $Q_i$  (with  $i \in \{1, 2\}$ ) in region  $A$  does reduce the demand faced by the chain in region  $B$ . The following lemma states and characterizes the previous discussion on the investment incentives of hotel establishments as a function of whether the establishment belongs to a local or to an international chain, or to no chain at all. (A version of this lemma can be found in Calveras, 2003). We leave the analysis of the equilibrium to proposition 1.

**LEMMA 3** (*Calveras, 2003*). *The incentives of establishments  $i \in \{1, 2\}$  to invest in environmental quality in region  $A$  are largest when they belong to a local hotel chain, and are smallest when they belong to an international chain.*

First order conditions above allow us to discuss the intuition of this lemma 3, which describes one of the driving forces in the expansion of a hotel chain studied below in Section 4. On the one hand, the environmental quality of a region (and of the hotel establishments within) is characterized by being a *public good* jointly produced by all hotel establishments in the region. Since a local chain appropriates a larger fraction of the returns of investing in quality than a single hotel establishment, its incentives to invest in environmental quality are also larger. On the other hand, competitive advantage at a global basis is provided by the environmental quality of the region. To the extent that, for an international chain, increasing the environmental

quality of a region implies reducing the competitive advantage of its hotel establishments in the other region, its incentives to invest will be smaller than those of an establishment or a chain only located in just one region.<sup>4</sup>

### 3.4 *Environmental quality of the regions*

In Appendix A1 the equilibrium investments of each establishment under each possible organizational scenario are obtained. Then, the following proposition characterizes the resulting environmental qualities (given by the investments of hotel establishments) of regions A and B. Let  $q_R^O$  be the final/resulting quality of region R when a market structure or organization  $O \in \{N, L, I\}$ , that is, whether no chain, a local chain, or an international chain, is formed.

PROPOSITION 1. 1. *Environmental quality of region A is largest when a local hotel chain is formed; and smallest when an international chain is formed; namely,  $q_A^L > q_A^N > q_A^I$ .*

2. *The environmental quality of region B is smallest when an international chain is formed; and it is largest when no chain is formed; namely,  $q_B^N > q_B^L > q_B^I$ .*

The first part of the proposition comes in a straight and intuitive manner from lemma 3 above. In equilibrium, the environmental quality of region A will be largest when a local chain has been formed, whereas

<sup>4</sup>Clearly though, there are other aspects not captured in our model that also affect the incentives of establishments to undertake environmental investments. For instance, reputational effects could be more important for an international chain than for a local chain or for a stand-alone establishment. There exists little empirical analysis on the effect of being part of a hotel chain in the adoption of environmental practices by a hotel establishment. Both Alvarez, Burgos and Cespedes (2001) and Gonzalez and Leon (2001) have found this to be positive and statistically significant. That is, hotel establishments that belong to a hotel chain undertake environmental practices in a larger degree than hotel establishments that do not belong to a hotel chain. Their intuition is that belonging to a hotel chain reduces the costs (e.g. through learning) of implementing environmental practices in a single establishment. In our model this would imply that an establishment belonging to a hotel chain would have a smaller cost of environmental investments  $c$  than an establishment not belonging to any chain. This should be true both in a local and in an international hotel chain. However, neither paper distinguishes between local or international chains. Hence, introducing their intuition in our model (hotel chains having smaller costs of environmental investments) would not alter the comparison of the incentives between a local and an international chain (though might change the comparison between an international chain and a stand-alone establishment).

it will be smallest when an international chain has been formed. Part 2 of the proposition, however, is also obtained as a consequence of environmental qualities of region A and region B being strategic substitutes; and this implies that the environmental quality of region B will be largest when no chain is formed in region A.

#### 4. Expansion strategy of a hotel chain

In this section we focus on stage 1, and enrich our model to study chain formation. Recall that 1 and 2 are hotel establishments in region A, and 3 is the hotel establishment in region B. The framework is as follows.

- Assume now that there is a fixed cost of running a hotel establishment: it costs  $F > 0$  to run one hotel establishment, regardless of the number of visitors. Therefore the overall profit of running establishment  $i \in \{1, 2, 3\}$  is the net operative profit minus the quality investment cost minus the fixed cost  $F$ . (Notice that the introduction of such a fix cost has no effect on the previous analysis regarding the investment and pricing decisions).
- Hotel establishment 1 innovates.<sup>5</sup> The innovation takes the form of a process innovation whereby the fixed cost of running the establishment is reduced to 0. Hence, running a hotel establishment with this new technology is more efficient.
- Because contracts are incomplete, this technology owned by owners of establishment 1 cannot be sold or licensed to the owners of other hotel establishments. Hence, even though it would be efficient to run all hotel establishments with this new technology, only hotel establishments owned by owners of 1 can be managed using the new technology.
- Forming a hotel chain entails some organizational cost. Thus, while there exist scale economies at a plant (establishment) level, there are organizational diseconomies of scale at a firm (chain) level. We assume that scale diseconomies at a chain level are so large that only chains made up of at most two establishments are possible. For instance, a potential constraint on the firm's growth could arise due to the firm's limited ability to expand its

<sup>5</sup>In our framework innovation occurs exogenously. For a work which endogenizes R&D in the analysis of MNEs, see e.g. Norbäck (2001).

management across several establishments. Thus, we disregard the possibility that a chain formed by all three establishment is formed.<sup>6</sup>

- Furthermore, we consider the existence of additional costs  $\theta > 0$  of going international (because undertaking production in a foreign country has additional costs, e.g. due to the necessity of learning a foreign language; Dunning, 1977).

#### 4.1 *Equilibrium organizational structure*

We treat the formation of a chain as a cooperative game of coalition formation, following the approach developed and used in Horn and Persson (2001a, 2001b). Their starting point is the observation that since firms are free to communicate about mergers, and can sign binding contracts, it is natural to treat merger formation (chain formation in our case) as a cooperative game of coalition formation (specially, considering the lack of a suitable non-cooperative formation). Furthermore, their approach incorporates to the standard cooperative framework the existence of externalities between coalitions as, for instance, the impact of a merger on the party left outside. And it also generalizes the criterion for merger incentives employed in the industrial organization literature.<sup>7</sup>

A central concept in their analysis is the *dominance relation*. If a market or organizational structure  $O''$  is *dominated* by another organizational structure  $O'$ , the former will not be the outcome of the merger (chain formation) game, since it is in the interest of the establishments with power - who in their terminology are 'decisive' with respect to  $O'$  and  $O''$  - to enforce  $O'$  whenever  $O''$  threatens to be the alternative. Their merger formation model has thus three basic components: 1) a specification of the owners determining whether one organizational

<sup>6</sup>An alternative might be to assume that firms are financially constrained. Horst (1974) summarizes the literature on financial constraints on the firm's growth in the context of MNEs.

<sup>7</sup>Traditionally, the IO literature has discussed the merger incentives by comparing alternative organizational or market structures, in which one of the structures is a strict concentration of the other structure. The approach of Horn and Persson includes this (as we do in our framework, when comparing for instance between a local chain and a no chain structure). However, the approach of Horn and Persson also includes the comparison of structures in which one of them is not a strict concentration of the other such as, for instance, comparing a local chain to an international chain.

(or ownership) structure dominates another structure; 2) a criterion for determining when these owners prefer the former structure to the latter; and 3) a stability (solution) criterion that selects the organizational structures seen as solutions to the merger (chain) formation game on the basis of all pairwise dominance rankings. When forming a chain, the owners of the establishments participating in the chain can freely choose how to distribute the chain's profits among themselves. The only constraint imposed on these payoffs is that each chain distributes exactly (no more, no less) the profit it makes to its owner(s).

— *Decisive owners*

The definition of the dominance relation is such that for some market or organizational structure  $O'$  to dominate or block another structure  $O''$ , all owners involved in forming and breaking up chains (mergers) between the two structures, in some sense prefer the dominating structure to the other structure. The question is which owners should then be expected to be able to influence whether  $O'$  dominates  $O''$ ? The answer of Horn and Persson depends on the coalition, on the structures that we are considering, that we are comparing. Owners belonging to identical coalitions in the two structures cannot affect whether  $O'$  will be formed instead of  $O''$ ; but all remaining owners can influence this choice.

For instance, in our framework, when comparing the formation of a *local chain* with *no chain* at all, that is, when comparing structure  $\{(1, 2), 3\}$  with  $\{1, 2, 3\}$ , establishment 3 cannot affect whether a local chain will be formed since payments between coalitions are not allowed. Thus, in this case, decisive owners are those of establishments 1 and 2. However, when comparing a *local chain* with an *international chain*, that is, when comparing structure  $\{(1, 2), 3\}$  with  $\{(1, 3), 2\}$ , all owners of the three establishments are decisive owners.<sup>8</sup>

<sup>8</sup>In their papers, Horn and Persson consider the possibility that, when comparing two organizational structures, there may be different groups of decisive owners. With more than one decisive group, these groups may dominate in opposite directions. They therefore require that for  $O'$  to dominate  $O''$ , domination holds for each decisive group with respect to  $O'$  and  $O''$ . Notice, however, that in our three establishment framework, for each organizational structure comparison there is only one decisive group. Thus, as a consequence, it is always the case in our setup that one structure either dominates or is dominated by the other.

— *Dominance*

Having identified the owners who decide whether one market structure dominates another, we now come to the second central question: when should the set of decisive owners be said to prefer one structure to another? Following Horn and Persson, we say that  $O'$  dominates  $O''$  via a decisive group if and only if the combined profit of the decisive group is larger in  $O'$  than in  $O''$ .

— *Equilibrium Organizational Structures*

The definition of decisive groups and the dominance relation describes how to rank any pair of ownership structures. It remains to specify how these rankings should be employed in order to predict the outcome of the chain formation game. To this end, we define those structures that are undominated, i.e. that are in the core, as Equilibrium Organizational (or ownership) Structures (EOS).

Thus, according to this definition, we say that

- A *no chain* is an Equilibrium Organizational Structure when all of the following conditions hold:  $\{1, 2, 3\}$  dominates  $\{(1, 2), 3\}$ ;  $\{1, 2, 3\}$  dominates  $\{(1, 3), 2\}$ ; and  $\{1, 2, 3\}$  dominates  $\{1, (2, 3)\}$
- A *local chain* is an Equilibrium Organizational Structure when all of the following conditions hold:  $\{(1, 2), 3\}$  dominates  $\{1, 2, 3\}$ ;  $\{(1, 2), 3\}$  dominates  $\{(1, 3), 2\}$ ;  $\{(1, 2), 3\}$  dominates  $\{1, (2, 3)\}$ .
- An *international chain* made up of establishments 1 and 3 is an Equilibrium Organizational Structure when all of the following conditions hold:  $\{(1, 3), 2\}$  dominates  $\{1, 2, 3\}$ ;  $\{(1, 3), 2\}$  dominates  $\{(1, 2), 3\}$ ;  $\{(1, 3), 2\}$  dominates  $\{1, (2, 3)\}$ .

In the following section we thus study when an international or a local chain will be an Equilibrium Organizational Structure in our framework. As we said above, an advantage of Horn and Persson analysis is that it can be applied to situations with more than one cooperative merger, and it permits dominance rankings between organizational structures where neither is a strict dominance of the other.<sup>9</sup>

<sup>9</sup>However, a drawback of our cooperative framework as a description of the chain formation process is that we are not capable of specifying which will be the payments within any given equilibrium coalition.

4.2 *Expand internationally or locally?*

Intuitively, a chain will be formed as long as the organizational costs are not too large. In addition to the organizational costs, there are two benefits of the creation of a chain. First, the technology transfer which allows to save on the fix costs of running an establishment. And second (as shown above in section 3), the strategic effects of the creation of the chain: for a local chain, the increase in environmental investments by the local chain in region  $A$ ; and for an international chain, the reduction in competition between regions. Given this, it is left to see which of the two benefits is largest and, therefore, which type of expansion (local or international) occurs in equilibrium. First, though, the following lemma states that a chain will always be formed.

LEMMA 4 *A local chain always dominates a no chain organizational structure. As a consequence, no chain formation will not be an Equilibrium Organizational Structure.*

This lemma implies that either a local chain or an international chain (when it dominates the local chain) is an Equilibrium Organizational Structure.<sup>10</sup> Next, the following lemma characterizes when a local chain, as opposed to an international chain, is formed.

LEMMA 5 *A local chain is formed if and only if  $\frac{\tau}{2} + \frac{1}{18\tau} (q_A^L - q_B^L)^2 - c(Q_1^L) - c(Q_2^L) - c(Q_3^L) \geq \frac{\tau}{2} + \frac{1}{18\tau} (q_A^I - q_B^I)^2 - c(Q_1^I) - c(Q_2^I) - c(Q_3^I) - \theta$ . Otherwise, an international chain made up of establishments 1 and 3 will be formed.*

Lemma 5 mathematically states when a local as opposed to an international chain will be formed. Basically, as can be seen in the proof, a local chain will arise when the overall profits of the decisive owners (all three establishments) when there is a local expansion are larger than when an international chain is formed. The next proposition characterizes the expansion strategy of a chain as a function of  $\alpha_A$  and  $\alpha_B$ .

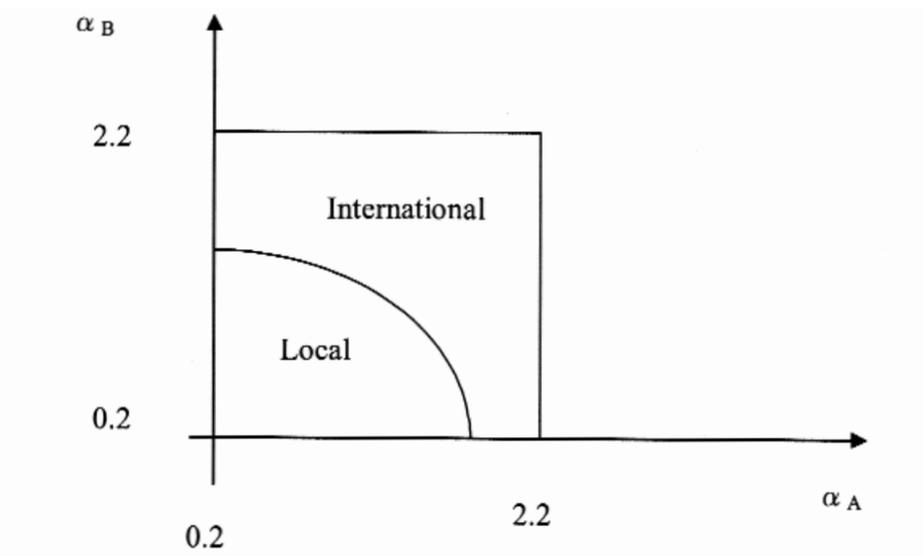
PROPOSITION 2. *Establishment 1 expands locally when the combined environmental potential capacity of the two regions is not so large;*

<sup>10</sup>Lemma 3 does not state that an international chain always dominates a no-chain structure because of the costs  $\theta$  of going international; otherwise, with  $\theta = 0$ , an international chain would also dominate a no chain structure. Recall also that we excluded a three establishment chain.

namely, when  $\alpha_A + \alpha_B$  is not so large. Otherwise (for  $\alpha_A + \alpha_B$  large enough), establishment 1 expands internationally.

We are able to state Proposition 2 by means of combining Lemmas 4 and 5 and undertaking numerical simulations, a sample of which are provided in Appendix A3. Take, for the moment,  $c = 1$ ,  $\tau = 1$  and  $\theta = 0.03$  (where, recall,  $\theta$  is the extra cost of going international). Then, Figure 1 (a representation of the first table in Figure A3.1 in Appendix A3) shows us when the owners of establishment 1 will expand internationally as opposed to locally, as a function of  $\alpha_A$  and  $\alpha_B$ .

FIGURE 1  
International vs. local expansion



What is, thus, the intuition behind Figure 1? Notice that the frontier in Figure 1 dividing the *local expansion* from the *international expansion* equilibrium organizational structure is of the form of  $\alpha_A + \alpha_B \approx X$ . Thus, we see that, on the one hand, when  $\alpha_A + \alpha_B$  is not so large a local expansion will take place in equilibrium; and, on the other hand, when  $\alpha_A + \alpha_B$  is large enough, then an international expansion will take place in equilibrium.

Recall from Lemma 3 that the benefits of an international expansion arise from the mitigation of competition in environmental quality that this international expansion causes. This benefit is largest when the combination of both regions' potential competitive advantage in envi-

ronmental quality is large enough. A corollary obtained straightforward from the result stated in Proposition 2 is the following one.

**COROLLARY 1.** *Establishment 1 will expand internationally when the foreign region has a high enough environmental potential advantage (i.e. a large enough  $\alpha_B$ ). More specifically,*

- *An establishment located in a region with a low  $\alpha_A$ , will expand internationally only if the foreign region has a very high environmental potential advantage  $\alpha_B$ .*
- *Otherwise, when the home region enjoys a very high  $\alpha_A$ , then establishment 1 will expand internationally for sure, whatever the  $\alpha_B$ .*

## 5. From a local to an international chain

All along, we have interpreted our model as that of explaining the expansion strategy of a hotel chain, starting from an initial situation in which there is no chain and, then, a (local or international) chain is formed. However, there is really nothing intrinsic in the model which makes the no chain situation as the initial situation. Hence, the model should also be able to include a discussion on, for instance, the switch from being a local chain and turning into an international chain.

As a matter of fact, such a trend has been followed by some of the major Balearic hotel chains, such as Barceló and Sol-Melià. These chains, for some time already, have been adopting a strategy of selling (disinvesting) hotel establishments in the Balearic Islands, while expanding at an international level by acquiring (or investing in) new establishments in places such as, e.g. the Caribbean. Clearly, the motivation behind such a move is multiple and it is beyond the scope of this paper to provide a comprehensive explanation. However, we see that within our framework we are capable of providing an (at least plausible) explanation for such a strategy. As a previous step though, we include in our analysis a discussion of the strategy followed by a hotel chain when regions A and B do not compete in attracting tourists.

### — *Non competing regions*

All above we have assumed that regions A and B effectively compete in attracting tourists. This is so when  $r$  in the utility function of the potential tourists is large enough. However, for  $r$  not so large, it may

be the case that regions  $A$  and  $B$  do not compete; namely, there are some potential tourists that do not go on vacation. What can we say about chain formation in this scenario?

Notice first that when regions do not compete (to simplify, suppose that neither before the formation of a chain nor afterwards), the investment strategy of establishment 3 in region  $B$  will always be the same, regardless on whether it belongs to an international chain or it is a stand-alone establishment (and also independent on the level of quality investments of establishments in region  $A$ ). Also notice that the investments of establishments 1 and 2 will depend on whether they are part of a local chain or not, but will not depend on the investments of establishment 3, since there is no effective competition. For all this, when regions  $A$  and  $B$  do not compete, the following lemma and proposition are obtained.

**LEMMA 6** *When regions  $A$  and  $B$  do not compete in attracting tourists, then  $Q_1^L > Q_1^N = Q_1^I$ , and also  $Q_3^L = Q_3^N = Q_3^I$ . As a consequence,  $q_A^L > q_A^N = q_A^I$ , and  $q_B$  is the same regardless of the organizational scenario.*

**PROPOSITION 3.** *When regions do not compete in attracting tourists, a local chain will be formed between the owners of establishment 1 and 2, and no international chain will ever be formed.*

The intuition goes as follows. Since there is no benefit of an international expansion in diminishing competition between regions (since there is no competition), then the benefit of reducing the free-riding in the provision of the environment drives the local hotel chain formation.

— *From local to international*

Given this, what can we say now about the move of some of the major hotel chains of the Balearic Islands, consisting of desinvesting in the Balearic Islands and expanding internationally? This, in our model, should be interpreted as a switch from an organizational structure in which there is a local hotel chain, namely, the organizational structure is  $\{(1, 2), 3\}$ , to an organizational structure with an international chain,  $\{(1, 3), 2\}$ . Consider an initial situation where there is no competition between regions  $A$  and  $B$ . Then, as we have seen above, our framework predicts the existence of a local chain. Consider that, for whatever reason, regions  $A$  and  $B$  come to compete in the attraction of tourists (e.g. an increase in the rent of potential tourists and, as a consequence, an increase in their valuation  $r$  of going on vacation).

As a consequence, whenever the environmental attractiveness of both the home and the foreign region are large enough (that is,  $\alpha_A + \alpha_B$  is large enough), our framework predicts that an organizational structure with an international chain will arise. This implies that the owners of establishment 1 sell off establishment 2 and buy establishment 3. We summarize this analysis in the following corollary (to Propositions 2 and 3).

**COROLLARY 2.** *An increase in the willingness of potential tourists of going on vacation (an increase in  $r$ ) may induce a chain to switch from a regional strategy into an international one.*

## 6. The mode of expansion

We have considered in our analysis that the expansion of the chain takes place through direct ownership: owners of establishment 1 buy another establishment and, thus, the hotel chain is all under the same ownership. The hotel industry, though, is one in which a rich variety of contractual forms are present, from direct ownership, to management contracts and franchising. In Spain, for instance, in the year 2000, 59.2 % of hotel establishments were under direct ownership, while 19.3 % of the hotel establishments were under a *management contract* (Federación Española de Hoteles, 2000).<sup>11</sup> Thus, it seems interesting to incorporate (at least partially) in our analysis the possibility that a hotel chain is formed by means of *management contract*. In short, a management contract consists of an agreement between a company (the chain) and the owner of the establishment whereby the chain manages the establishment, taking all operational decisions, and obtaining a fee (e.g. a share of all revenue) for its services (Martorell, 2002).

— *The organizational form of the chain and environmental investments*

Since our focus is all along on environmental quality, we need to distinguish the incentives to invest in environmental quality depending on the type of chain, whether a chain with hotel establishments run with direct ownership, or a chain organized with management contracts. We will assume, so as to simplify the analysis that stand alone

<sup>11</sup>At a world level, the importance of franchises is much larger, mostly because of its importance in the largest world market, the USA; thus, around 59 % of hotel rooms all over the world were in franchise in the year 1998 (see Ramon Rodríguez, 2002).

establishments are always managed directly by the owners, while a chain can be either managed (the two establishments) directly by the owners, or managed all of it through management contracts. Then, what is the effect of the mode of expansion, of the organizational form of the chain, on its incentives to invest in environmental quality? We take the following position:

*ASSUMPTION. A hotel chain managed directly by the owners has higher incentives to invest in environmental quality than a chain run through management contracts.*

The intuition behind such a stand lies in the idea that such environmental investments yield a return not only in the short term, but also in the long term. Then, to the extent that a management contract might have a shorter horizon span than direct ownership (due to the possibility of a breaking up the contract), a chain under direct ownership would be more capable to reap all of the profits of the investments and, thus, should undertake a higher investment in environmental quality. A very similar hypothesis is tested in Crespí-Cladera and Orfila (2005) with the hotel industry of the Balearic Islands, and the null hypothesis is not rejected by the data at a 10% significance level.<sup>12</sup>

At this stage, we model such distinction between a chain under direct ownership and a chain under a management contract in a very stylised and reduced form. We adopt as a benchmark all that discussed in the preceding sections about the chain under direct ownership. Then, we take (as a raw approximation) that the investments of a chain under a management contract are a percentage  $m \in (0, 1]$  of the investment done by the chain under direct ownership.

— *Geography and the mode of expansion*

Which is then the mode of expansion chosen by a chain when the expansion is international? And when it is a local expansion? Following the above framework used in Section 4, the chosen mode of expansion is that which yields higher profits to the so-called *decisive* coalition, that is, that which yields highest overall profits. The following proposition (obtained by means of simulations shown in Appendix A3) presents the results on the mode of expansion that will be chosen

<sup>12</sup> Additional evidence supporting our position on the effect of the organizational form of the chain on its environmental investments can be found in Christmann (2004).

(whether a management contract or direct ownership), as a function of the geographical scope of the expansion (local or international). As it turns out, the choice depends on whether the foreign region does compete (or not) with the home region.

*PROPOSITION 4. On the one hand, when regions compete in attracting tourists, the preferred mode of (an international or local) expansion is a management contract chain. On the other hand, when regions do not compete, the preferred mode of expansion is direct ownership.*

The intuition behind this proposition goes along the lines with all the preceding analysis. A major force driving the expansion of a chain is the mitigation of competition in environmental quality. Because of its effect on the incentives to invest in environmental quality, management contracts are chosen when the home and the foreign region compete. On the contrary, when the home and the foreign region do not compete, a management contract inefficiently distorts (lowering them) the incentives to invest in environmental quality. As a consequence, in this case, the chosen mode of expansion is direct ownership.

## **7. Concluding remarks**

The aim of this paper has been to formally analyze the role that environmental quality plays in the expansion strategy of a hotel chain. To do so, we have presented a model that allowed us to introduce the key elements present in the analysis. The results obtained are both original and intuitive: international expansion of a hotel chain will arise so as to mitigate competition in environmental quality and, as a corollary, international expansion will be more likely towards regions that are environmentally attractive. Furthermore, it is worth stressing that we are capable of encompassing within our framework the strategy followed by some of the major Balearic hotel chains (Sol-Melià, Barceló, etc.) consisting of selling off most of their establishments in the Balearic Islands, and then expanding internationally towards tourist resorts (Caribbean islands, Mexican coast North Africa) where environmental quality is clearly one of its main attractions. Finally, we have also discussed the mode of expansion of a hotel chain (direct ownership vs. management contracts); the results, though intuitive in our framework, should be taken with caution because of our focus on environmental quality, disregarding other important issues in the choice of the mode of expansion.

In addition to its managerial implications, the paper also points to policy implications. Proposition 1 states that the environment of the home region will be affected by the strategy followed by the hotel chain; that is, in case of an international expansion towards a competing tourist destination, the home environment will be negatively affected. As a consequence then, the regional government should discourage internationalization of local hotel establishments; rather, it should support the merger of local hotel chains so as to favor investments in environmental quality. However, a complete welfare and policy analysis is well beyond the scope of this paper, and it should also include several other factors in addition to the level of environmental quality; for instance, the welfare of tourists and residents (which would probably be considered in a different manner by a regional or a supraregional government), as well as the beneficial effects for the region of hosting the headquarters of an international firm.

Finally, it is clear that other factors (other than the environment) will also have an impact in the expansion strategy followed by a hotel chain. These might be the market structure of both the home and the foreign region, the capacity of accommodation in the foreign region, and a competitive interaction in the expansion process with other chains. These and many other things are left for future work. To conclude though, let me just stress the interest of future research in the industrial organization of the tourist sector. Such interest is driven by the importance (in any relevant measure such as, e.g. percentage in the GDP in many countries) of the tourist sector; and also by the specificities that the sector presents with respect to other sectors of the economy (e.g. the important presence of externalities in the production of the final tourist product).

### **Appendix A1. Equilibrium investment strategies**

In this appendix we analytically study investment strategies and equilibria in all three possible organizational scenarios. Recall that for simplicity we set  $c(Q_i) = \frac{c}{2}Q_i^2$ . Then, let the profit of establishments 1, 2 and 3, respectively, be  $\pi_1 = \frac{1}{2}p_A \frac{D_A}{2} - \frac{c}{2}Q_1^2$ ;  $\pi_2 = \frac{1}{2}p_A \frac{D_A}{2} - \frac{c}{2}Q_2^2$ ;  $\pi_3 = \frac{1}{2}p_B D_B - \frac{c}{2}Q_3^2$ . Let the profit of the local chain (formed by establishments 1 and 2) be  $\pi^L = \frac{1}{2}p_A D_A - \frac{c}{2}Q_1^2 - \frac{c}{2}Q_2^2$ ; and let the profit of the international chain (formed by establishments 1 and 3) be  $\pi^I = \frac{1}{2}(p_A \frac{D_A}{2} + p_B D_B) - \frac{c}{2}Q_1^2 - \frac{c}{2}Q_3^2$ . Recall that for the moment we focus in the scenario in which  $r$  is *large enough* so that regions always compete no matter the organizational form.

It is easy to see that in all three organizational scenarios (no chain, a local chain, an international chain),  $p_A - p_B = \frac{2}{3}(q_A - q_B)$ . Then,  $D_A = \frac{\frac{1}{3}(q_A - q_B) + \tau}{2\tau}$  and  $D_B = 1 - \frac{\frac{1}{3}(q_A - q_B) + \tau}{2\tau}$ . Therefore,  $D_A = \frac{p_A}{2\tau}$ , and  $D_B = \frac{p_B}{2\tau}$ . Furthermore, it is also useful to compute  $\frac{\partial D_A}{\partial Q_{A1}} = \frac{\partial D_A}{\partial Q_{A2}} = \frac{\alpha_A}{12\tau}$  and  $\frac{\partial D_A}{\partial Q_B} = \frac{-\alpha_B}{6\tau}$ .

— *Scenario 1: No hotel chain*

In Scenario 1, each hotel establishment chooses its own environmental quality investments  $Q$  independently (taking as given the investments of the others). Then, first order conditions (FOC) of all three maximizations problems are

$$\frac{\alpha_A}{12}D_A = cQ_1, \quad \frac{\alpha_A}{12}D_A = cQ_2, \quad \text{and} \quad \frac{\alpha_B}{3}D_B = cQ_3.$$

And the required second order conditions (SOC) to ensure that FOC yield maximum are  $\alpha_A^2 < 144\tau c$ , and  $\alpha_B^2 < 18\tau c$ .

By solving the system of equations it is easy to find equilibrium environmental investments under this organizational structure:  $Q_1^N =$

$$\frac{1}{6}\alpha_A \frac{\alpha_B^2 - 9c\tau}{c\left(2\alpha_B^2 + \frac{\alpha_A^2}{2} - 36c\tau\right)}; \quad Q_2^N = \frac{1}{6}\alpha_A \frac{\alpha_B^2 - 9c\tau}{c\left(2\alpha_B^2 + \frac{\alpha_A^2}{2} - 36c\tau\right)};$$

$$Q_3^N = \frac{1}{3}\alpha_B \frac{\frac{\alpha_A^2}{2} - 18c\tau}{c\left(2\alpha_B^2 + \frac{\alpha_A^2}{2} - 36c\tau\right)}.$$

— *Scenario 2: A local chain*

In this case, hotel establishment 1 and 2 form a local hotel chain. Then, the local hotel chain decides how much to invest in environmental quality in both hotel establishments, whereas in region  $B$  hotel establishment 3 chooses environmental investments autonomously. FOC are

$$\frac{\alpha_A}{6}D_A = cQ_1, \quad \frac{\alpha_A}{6}D_A = cQ_2, \quad \text{and} \quad \frac{\alpha_B}{3}D_B = cQ_3.$$

Notice that the FOC of local hotel chain in  $A$  is the same as those of a hotel establishment in  $A$  in scenario 1 except that the FOC of the local chain is not divided by 2. And the required SOC to ensure that FOC yield maximum are  $\alpha_A^2 < 36\tau c$ , and  $\alpha_B^2 < 18\tau c$ . By focusing again in the symmetric equilibrium, we derive equilibrium investments:  $Q_1^L = \frac{1}{6}\alpha_A \frac{\alpha_B^2 - 9c\tau}{c\left(\alpha_B^2 + \frac{1}{2}\alpha_A^2 - 18c\tau\right)}$ ;  $Q_2^L = \frac{1}{6}\alpha_A \frac{\alpha_B^2 - 9c\tau}{c\left(\alpha_B^2 + \frac{1}{2}\alpha_A^2 - 18c\tau\right)}$ ;

$$Q_3^L = \frac{1}{3}\alpha_B \frac{\frac{1}{2}\alpha_A^2 - 9c\tau}{c\left(\alpha_B^2 + \frac{1}{2}\alpha_A^2 - 18c\tau\right)}.$$

— Scenario 3: An international chain

In this scenario, hotel establishment 1 and 3 form an international hotel chain. Then in this situation, the international hotel chain chooses environmental quality of both establishments 1 and 3. The FOC are

$$\frac{\alpha_A}{12} (3D_A - 2) = cQ_1, \quad \frac{\alpha_A}{12} D_A = cQ_2, \quad \text{and} \quad \frac{\alpha_B}{6} (2 - 3D_A) = cQ_3$$

Notice that  $D_A \leq \frac{2}{3}$  is important. Solution is:

$$Q_1 = -\frac{1}{24}\alpha_A \frac{\frac{1}{2}\alpha_A^2 - 18c\tau}{c(\frac{3}{2}\alpha_B^2 + \frac{1}{2}\alpha_A^2 - 18c\tau)}, \quad Q_2 = \frac{1}{24}\alpha_A \frac{2\alpha_B^2 + \frac{1}{2}\alpha_A^2 - 18c\tau}{c(\frac{3}{2}\alpha_B^2 + \frac{1}{2}\alpha_A^2 - 18c\tau)},$$

$Q_3 = \frac{1}{12}\alpha_B \frac{\frac{1}{2}\alpha_A^2 - 18c\tau}{c(\frac{3}{2}\alpha_B^2 + \frac{1}{2}\alpha_A^2 - 18c\tau)}$ . Notice that then we would have that  $Q_1 < 0 < Q_3$ . Then, imposing the restriction that environmental investments must be non negative, we have that (because of the concavity properties of the function),  $Q_1 = 0$ . Then, the equilibrium environmental investments are determined by the following conditions:

$$Q_1 = 0, \quad \frac{\alpha_A}{12} D_A = cQ_2, \quad \text{and} \quad \frac{\alpha_B}{6} (2 - 3D_A) = cQ_3.$$

And then the equilibrium investments are:

$$Q_1^I = 0; \quad Q_2^I = \frac{1}{3}\alpha_A \frac{\alpha_B^2 - 9c\tau}{c(\frac{1}{2}\alpha_A^2 + 6\alpha_B^2 - 72c\tau)}; \quad Q_3^I = \frac{1}{3}\alpha_B \frac{\frac{1}{2}\alpha_A^2 - 18c\tau}{c(\frac{1}{2}\alpha_A^2 + 6\alpha_B^2 - 72c\tau)}$$
. And the required SOC to ensure that these investments are a maximum are  $\alpha_A^2 < 48\tau c$ , and  $\alpha_B^2 < 24\tau c$ , and  $(\frac{\alpha_A^2}{48\tau} - c)(\frac{\alpha_B^2}{12\tau} - c) > (\frac{\alpha_A\alpha_B}{24\tau})^2$ .

**Appendix A2. Proofs of lemmas and propositions**

PROOF OF LEMMA 1. Suppose  $r$  is large enough so that all tourists travel either to region  $A$  or to region  $B$ . Let  $x^*$  be the location of the tourist that is indifferent between going to region  $A$  or to region  $B$ , that is, the tourist such that  $u(x^*, A) = u(x^*, B)$ . Through some simple algebra we obtain  $x^* = \frac{(q_A - q_B) - (p_A - p_B) + \tau}{2\tau}$ . Clearly, all tourists located at the left of  $x^*$  prefer to go on vacation to region  $A$ , whereas all tourists located at the right of  $x^*$  prefer to go on vacation to region  $B$ . Hence, in this case, the demand faced by region  $A$  is  $x^*$  and  $(1 - x^*)$  is the demand faced by region  $B$ . ■

PROOF OF LEMMA 2. Suppose  $r$  is large enough so that all tourists go on vacation. First order conditions of the TO optimization problem are  $D_A + \frac{\partial D_A}{\partial p_A} \cdot p_A = 0$  and  $D_B + \frac{\partial D_B}{\partial p_B} \cdot p_B = 0$ . This system of equations determines equilibrium prices  $(p_A^*, p_B^*)$  (it is very easy to check that second order conditions are always satisfied). ■

PROOF OF PROPOSITION 1. We have to show that  $q_A^I < q_A^N < q_A^L$ . Recall that  $q_A^* = \frac{1}{2}\alpha_A(Q_1^* + Q_2^*)$ .

1) Given the analysis in appendix A1, notice that

$$q_A^I = \frac{1}{2}\alpha_A \left( 0 + \frac{1}{3}\alpha_A \frac{\alpha_B^2 - 9c\tau}{c(\frac{1}{2}\alpha_A^2 + 6\alpha_B^2 - 72c\tau)} \right)$$

$$< q_A^N = \frac{1}{2}\alpha_A \left( \frac{1}{6}\alpha_A \frac{\alpha_B^2 - 9c\tau}{c(\alpha_B^2 + \frac{1}{2}\alpha_A^2 - 18c\tau)} + \frac{1}{6}\alpha_A \frac{\alpha_B^2 - 9c\tau}{c(\alpha_B^2 + \frac{1}{2}\alpha_A^2 - 18c\tau)} \right)$$

provided that  $\alpha_B^2 < 9\tau c$ , which holds by assuming that second order conditions (SOC) hold. And, since  $Q_i^L > Q_i^N$ , it is straightforward that  $q_A^N < q_A^L$ . It is analogously proven for  $q_A^I < q_A^N$ .

2) The proof is analogous simply by comparing  $Q_3^I$ ,  $Q_3^N$  and  $Q_3^L$  from appendix A1, and taking into account second order conditions. ■

PROOF OF LEMMA 4. We want to show that a local chain dominates a no chain market structure; that is,  $\{(1, 2), 3\}$  dominates  $\{1, 2, 3\}$ . In this case, the decisive group is owners of establishments 1 and 2. Then, we need to show that  $\pi_{12}^L > \pi_1^N + \pi_2^N$ . Notice that  $\pi_{12}^L(Q_1^L, Q_2^L/Q_3^L) > \pi_{12}^L(Q_1^N, Q_2^N/Q_3^L)$ . Also  $\pi_{12}^L(Q_1^N, Q_2^N/Q_3^L) > \pi_{12}^L(Q_1^N, Q_2^N/Q_3^N)$  since  $Q_3^L < Q_3^N$  (which means that  $q_B^N > q_B^L$ ). And finally, see that  $\pi_{12}^L(Q_1^N, Q_2^N/Q_3^N) = \pi_1^N + \pi_2^N + F > \pi_1^N + \pi_2^N$ . QED. ■

PROOF OF LEMMA 5. The proof includes several steps.

*Step 1.* Notice that according to lemma 4 above a local chain dominates no chain at all.

*Step 2.* Notice that an international chain composed of establishments 1 and 3 dominates an international chain composed of establishments 2 and 3. This is easy to see. Notice that the decisive group when comparing market structures  $\{(1, 3), 2\}$  and  $\{1, (2, 3)\}$  is composed of all three establishments. Then, notice that the everything is symmetric for  $\{(1, 3), 2\}$  and  $\{1, (2, 3)\}$  except that for the former the innovation (zero fixed of running the establishment) is used in both establishment of the chain, whereas it is not used in the latter. As a consequence, the overall profit for the decisive group is larger when the international chain includes establishment 1, which means that the international chain with establishment 1 dominates the international chain without establishment 1. As a consequence, the international chain without establishment 1 is never an equilibrium organizational structure.

*Step 3.* There is only left to see whether a local chain as opposed to an international chain (made up of establishments 1 and 3) are an

equilibrium organizational structure. Steps 1 and 2 above allows us to state that whenever a local chain dominates an international chain, that is, whenever,  $\{(1, 2), 3\}$  dominates  $\{(1, 3), 2\}$ , a local chain will be an equilibrium organizational structure.

Thus, we have that  $\{(1, 2), 3\}$  dominates  $\{(1, 3), 2\}$  whenever

$$\begin{aligned} \pi_{12}^L - c(Q_1^L) - c(Q_2^L) + \pi_3^L - c(Q_3^L) - F > \pi_{13}^I - c(Q_1^I) \\ - c(Q_3^I) + \pi_2^I - c(Q_2^I) - F - \theta. \end{aligned} \tag{A2.1}$$

Notice that through some mathematics in appendix A1 we obtained that  $D_A = \frac{\tau + \frac{1}{3}(q_A - q_B)}{2\tau}$  and  $D_B = \frac{\tau + \frac{1}{3}(q_B - q_A)}{2\tau}$ . Then, in addition,  $\pi_{12}^L = \frac{1}{2}p_A D_A$ ,  $\pi_3^L = \frac{1}{2}p_B D_B$ ,  $\pi_{13}^I = \frac{1}{2}p_A \frac{D_A}{2} + \frac{1}{2}p_B D_B$ , and  $\pi_2^I = \frac{1}{2}p_A \frac{D_A}{2}$ . Then, with some analytical computations we derive the expression of the lemma. QED. ■

PROOF OF LEMMA 6 AND PROPOSITION 3. We leave it to the readers since it should be straightforward from all previous analysis. Notice, though, that demands, prices and environmental investments should be derived for this case in which there is no competition between regions (not all potential tourists go on vacation). Then, computing environmental quality of each region is very simple (since there is no interaction between regions). As a consequence, lemma 6 and proposition 3 are very easy to obtain even without simulations.

### Appendix A3. Simulations

Here we show (in the tables of Figures A3.1 and A3.2) a sample of the simulations that (altogether with lemmas 4 and 5) provide us with *Proposition 2 and Figure 1*. With the values proposed in the tables, using expressions obtained in appendix A1, and then computing expression of Lemma 5, we are able to obtain the Equilibrium Organizational Structure: L means that the expansion is local, whereas Int means the expansion is international. We see (in Tables of Figure A3.1) that the frontier separating a local expansion from an international expansion is always analogous to that of Figure 1.

TABLE A3.1  
Simulations: investments, profits and expansion

		1,2000	1,2000	1,2000	1,2000	1,2000
		0,2000	0,7000	1,2000	1,7000	2,2000
Local chain	$Q_1, I, Q_2$	0,1039	0,1014	0,0955	0,0849	0,0669
	$Q_3$	0,0320	0,1151	0,2091	0,3261	0,4881
	$q_A$	0,1247	0,1216	0,1145	0,1019	0,0803
	$q_B$	0,0064	0,0805	0,2509	0,5543	1,0738
	$q_A - q_B$	0,1183	0,0411	-0,1364	-0,4524	-0,9936
	$(q_A - q_B)^2$	0,0140	0,0017	0,0186	0,2047	0,9872
	$X$	0,5197	0,5068	0,4773	0,4246	0,3344
International chain	$Q_1$	0,0000	0,0000	0,0000	0,0000	0,0000
	$Q_2$	0,0505	0,0498	0,0483	0,0453	0,0394
	$Q_3$	0,0162	0,0590	0,1103	0,1815	0,3000
	$q_A$	0,0303	0,0299	0,0290	0,0272	0,0236
	$q_B$	0,0032	0,0413	0,1324	0,3086	0,6600
	$q_A - q_B$	0,0270	-0,0114	-0,1034	-0,2814	-0,6364
	$(q_A - q_B)^2$	0,0007	0,0001	0,0107	0,0792	0,4050
	$X$	0,5045	0,4981	0,4828	0,4531	0,3939
Profits						
	$\Pi_{12}^L$	0,2593	0,2466	0,2187	0,1731	0,1074
	$\Pi_3^L$	0,2302	0,2366	0,2514	0,2779	0,3239
	$\Pi_{12}^L + \Pi_3^L$	0,4895	0,4832	0,4701	0,4510	0,4312
	$\Pi_{13}^I$	0,3426	0,3442	0,3480	0,3553	0,3699
	$\Pi_2^I$	0,1260	0,1228	0,1154	0,1016	0,0768
	$\Pi_{13}^I + \Pi_2^I$	0,4686	0,4670	0,4633	0,4569	0,4467
Type of expansion		Local	Local	Local	Intern	Intern

TABLE A3.1  
Simulations: expansions as a function of  $\alpha_A$  and  $\alpha_B$

$c=1, \tau=1; \theta=0.03$

		$\alpha_B$				
		0.2	0.7	1.2	1.7	2.2
$\alpha_A$	0.2	L	L	L	L	Int
	0.7	L	L	L	L	Int
	1.2	L	L	L	Int	Int
	1.7	L	L	Int	Int	Int
	2.2	L	Int	Int	Int	Int

$c=1.5, \tau=1; \theta=0.03$

		$\alpha_B$				
		0.2	0.7	1.2	1.7	2.2
$\alpha_A$	0.2	L	L	L	L	L
	0.7	L	L	L	L	L
	1.2	L	L	L	L	Int
	1.7	L	L	I	Int	Int
	2.2	L	L	L	Int	Int

$c=1, \tau=0.75; \theta=0.03$

		$\alpha_B$				
		0.2	0.7	1.2	1.7	2.2
$\alpha_A$	0.2	L	L	L	L	L
	0.7	L	L	L	L	L
	1.2	L	L	L	Int	Int
	1.7	L	L	Int	Int	Int
	2.2	L	Int	Int	Int	Int

Regarding Proposition 4, simulations are also used. Notice that in Proposition 4 there are two cases. Case 1) for when regions compete, and case 2) for when regions do not compete. For case 1) we compute the overall profits of all agents for an international expansion and for a local expansion, both in the case for which the chain is run with management contracts, and for the case in which the chain is run directly by the owners. In all of our results, the overall profit is larger for the case in which the chain is run with management contracts. One example of the simulations is the following. Take  $c = 1$ ,  $\tau = 1$  and  $\theta = 0.03$ . Also, take  $\alpha_A = 1.2$ , and  $\alpha_B = 1.7$ . Then, for an international expansion, with direct ownership the overall profit is 0.4569, while with management contracts the overall profit is 0.4591. As a consequence, a management contract chain is preferred. For a local expansion, with direct ownership the overall profit is 0.4510, while with management contracts the overall profit is 0.4528. As a consequence, a management contract chain is also preferred.

Regarding case 2) in which regions do not compete, the reasoning and the intuition of the statement should be straight. Consider first a local expansion; in this case, with a local chain run directly by owners, these could, if they wanted, reduce their investment. If they do not, that is because it would reduce their profits. And this does not affect in any way the establishment in region B since there is no competition between regions. Consider next an international expansion. Then, a chain run with management contracts reduces overall profits since it has the effect of reducing investments below the efficient level since, in this case, there is no competition. As a consequence, when regions do not compete, the preferred mode of expansion is a chain run directly by owners.

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## Resumen

*En este artículo analizamos de qué manera la estrategia de expansión de una cadena hotelera se ve influida por la calidad medioambiental tanto de la región doméstica como de la extranjera. Mostramos como el medio ambiente (que es un bien público, y determina la ventaja competitiva de los hoteles de la región) juega un doble papel en la estrategia de la cadena. Así, una cadena se expandirá internacionalmente cuando el potencial medioambiental combinado de ambas regiones es suficientemente grande. O, alternativamente, en una región doméstica con potencial de calidad medio-bajo, la cadena se expandirá internacionalmente cuando la región extranjera presente un potencial de calidad medioambiental suficientemente alto.*

*Palabras clave: Empresa multinacional, medio ambiente, industria turística.*

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