“Tragedy of the Commons” in the Tourism Accommodation Industry

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Abstract

This paper models the interaction between tourism accommodation industry and environmental quality – defined as a composite common pool resource. Results from the study show that open-access leads generally to both economic and environmental over-exploitation, i.e. “the tragedy of the commons”. This also affects the overall tourism industry since tourism accommodation and environmental quality perform central roles in it. This ultimately leads to mass tourism characterized by tourists with low willingness to pay.

The results show that, apart from situations where positive externalities on other activities are very significant, or that the open-access faces binding restrictions (such as land availability), firms’ entry should be limited, not only on the basis of efficiency but also on sustainability.

Keywords: common pool resources; open-access; externalities; accommodation industry.

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INTRODUCTION

The interaction between tourism and natural environment is generally one of impact and dependency. On the one hand, tourism generates impacts such as those associated with infrastructures (e.g. changing views and landscape), movement of people and vehicles (e.g. noise, air and water pollution) and over-utilisation of natural resources (Tisdell 2001). On the other hand, tourism is generally highly dependent on environmental quality. According to Mieczkowski (1995), the reason for this dependency is that tourism is the only sector that offers the natural environment as an important part of its product.

Natural environmental resources typically present common pool resources characteristics (Ostrom and Field 1999): the exploitation by one user reduces resource availability for others (subtractability) and exclusion of additional users is especially difficult and costly (difficulty of exclusion). Hardin's (1968) seminal paper warns that the users of these resources are caught in a process that leads to the destruction of resources upon which they depend. The author entitled this as "the tragedy of the commons".

After Hardin's paper, an extensive literature on common pool resources has been developed (Hess 2005). A few contributions in the tourism domain have also emerged. Healy (1994) addresses the common pool problem in tourism landscapes – what Jafari (1982) calls "background tourism elements" (BTEs), i.e. natural, sociocultural and built tourism attractions. It concludes of its susceptibility to overuse and the lack of incentive to invest in maintaining or improving them. It also analyses the different property rights used to manage these resources. Briassoulis (2002) discusses the central role of common pool resources for sustainable tourism development, and the policy design principles for their management. Recently, Field, Lass and Stevens (2004) studied the open-access externalities due to congestion and resource degradation in the southern Thai islands, through a revealed preference analysis. It concludes that open-access produces very substantial welfare losses, which may undermine tourism demand to the islands in the long run.

The present paper models the tourism accommodation industry, which both impacts and depends on the environmental quality – a composite common pool resource. Previous studies on the interactions between this industry and the environment have been centred on firms' incentives to invest in environmental quality. González and Léon (2001) study the adoption of environmental innovations in the hotel industry of Gran Canaria (Spain). The authors also establish a materials balance approach to the relationships between tourism accommodation services and the environment. Calveras (2003) shows that local hotel chains internalise to a greater extent the external impacts generated by investments on environmental quality and therefore have greater incentives to adopt environmental measures, when compared to international hotel chains.

This paper contributes to the literature by using microeconomic theory to model the problem of common pool resources in tourism accommodation industry. Thus, it helps to narrow the tourism literature gap on the microeconomic modelling of these resources. It also establishes a bridge, as suggested by Tisdell (2001), between the theory of open access in a tourism industry that relies on the environment and "some of the theory of common-property resources, as for instance developed for common-access in fishing [Gordon (1954) and Clark (1976) Chapter 2]".

This paper sets an approach to the "tragedy of the commons" in the tourism accommodation industry by modelling the market's demand and supply sides. It explores the open-access dynamics and equilibrium, as well as the social optimum solution, both in the absence and presence of externalities. The model results are used to show the economic dimensions of the problem and the management policies required.

THE MARKET MODEL

Consider a tourism destination whose main attractions are environmental amenities (e.g. sun and beach), which faces competition from many other destinations worldwide. In this section the local tourism accommodation market is modelled. The option for this industry was due to two motives: first, since accommodation is a pre-condition for tourism, it is usually regarded as barometer for the overall tourism sector; second, its direct and complementary infrastructures generally result in significant environmental impacts.

Demand

Given the existence of many competing destinations it is assumed that demand for accommodation services is perfectly elastic to price, for a given level of environmental quality (equation (1)). Hence, environmental quality is the factor that differentiates tourists' willingness to pay for substitute destinations. The importance of the environment on tourism demand is widely recognised – e.g. Huybers and

Bennet (2000) concluded that UK overseas tourists were willing to pay a substantial premium to visit a destination with a high level of environmental quality.

The environmental quality index (EQI), defined in (2), takes values in the range [0, 1] and decreases at an increasing rate with the number of firms. The number of firms is used as the determinant of environmental quality as, in the accommodation industry, the main environmental impacts emerge from the infrastructures associated with firms' establishment. The assumption that EQI decreases at an increasing rate reflects the idea that the greater the number of firms the greater the environmental quality loss due to the entrance of another firm. This index takes value one when there is no firm in the industry and zero when the number of firms is such that the environment no longer offers any tourism attraction – therefore, the corresponding price that tourists are willing to pay is nil.

Equation (2) sets a negative relationship between tourism development and environmental quality, which is typical of a *Conventional Mass Tourism*. However, other forms of tourism may lead to different relationships between tourism and environmental quality (Pigram 1980) – including the case in which environmental quality actually improves with tourism development. Another limitation of the relationship between tourism development and environmental quality proposed herein is that firms' investments on environmental measures are not considered. As González and Léon (2001) refer, firms' in the accommodation market usually find strategic opportunities in effective environmental management.

Equation (2) also implies that when a firm enters the industry it decreases the environmental quality available for all others (subtractability). As it is also difficult to exclude additional users of environmental quality, it clearly exhibits the properties of a composite common-pool resource – including, among others, landscapes, air and water quality and site sanitation.

$$P = aEQI \quad (1)$$

$$EQI = 1 - \left(\frac{n}{\bar{n}}\right)^2 \quad (2)$$

where P represents the price; EQI environmental quality index; a demand parameter; n number of firms; and $\bar{n}$ number of firms that drives the environmental quality index to zero.

Thus, the demand side of the market can be summarised as:

$$P = a\left(1 - \left(\frac{n}{\bar{n}}\right)^2\right) \quad (3)$$

Supply

The tourism accommodation industry is generally characterised by its diversity (Bull 1995). Not only it is common to find different products targeting different market segments, but also product differentiation within each segment – through factors such as service quality and location. This diversity, whenever there is freedom of entry and exit and a large number of firms, gives rise to a monopolistic competition market structure (Tribe 1999).

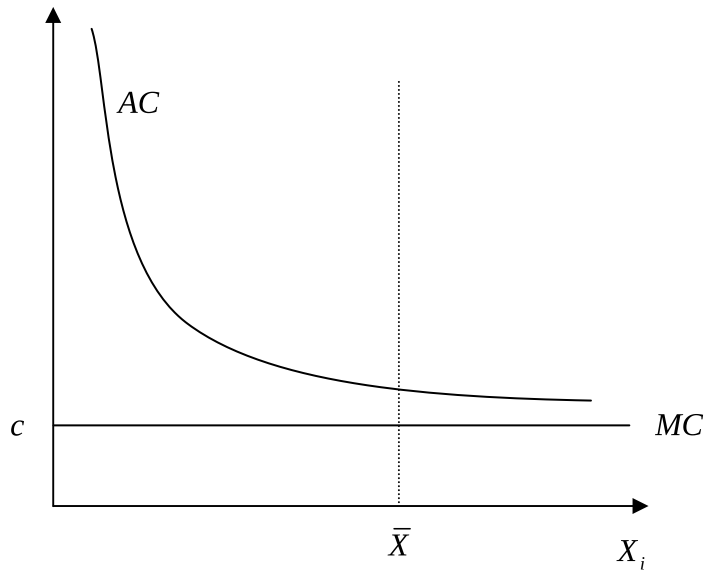
The present model assumes, nonetheless, a perfect competitive market with symmetric firms that supply a homogeneous product, use the same technology and are equally efficient. This assumption was considered appropriate for a theoretical approach to the outcomes of open access as it simplifies the model but does not change its main results. In fact, open-access dynamics and long-run outcomes are basically the same in monopolistic competition and in perfect competition. In both market structures, firms enter (leave) if there are economic gains (losses), yielding a long-run equilibrium where profits are nil. Furthermore, for empirical applications, the present model can be easily extended to handle different market segments and product differentiation.

The preponderance of fixed costs is a major feature of tourism supply, especially in the accommodation industry (Bull 1995). Marginal costs, on the other hand, are frequently very small and approximately constant. Following these characteristics the present model assumes a constant marginal cost, which is lower than the average cost at firm’s full capacity (Figure 1). The total cost function of firm i is defined as:

$$C\left(X_i\right) = cX_i + FC \tag{4}$$

where $C\left(X_i\right)$ represents the total cost of producing output X_i; c marginal cost; and FC - fixed cost.

Figure 1. Firm's Cost Structure

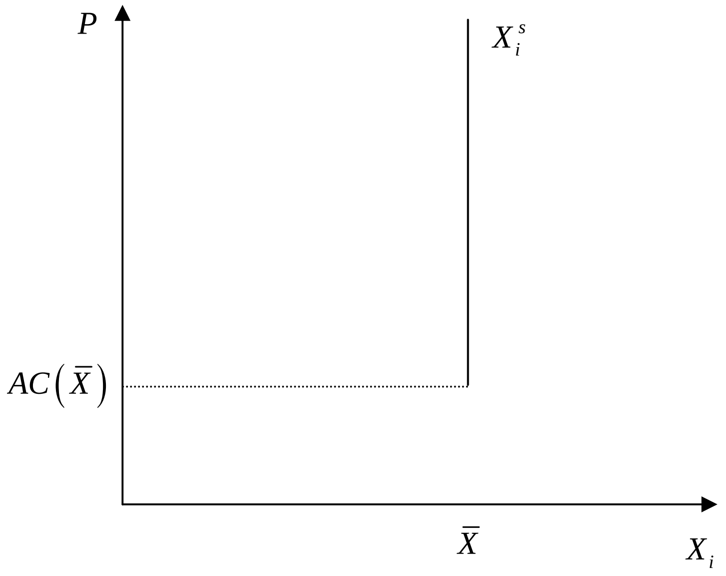


where AC represents the average cost; MC marginal cost; and FC fixed cost.

Each firm produces the output level that maximizes its profits. Hence, as marginal cost is lower than the average cost at full capacity output $\left(c < AC\left(\bar{X}\right)\right)$, the firm long-run supply curve is defined by (5) – which is represented in Figure 2.

$$X_i^s = \begin{cases} 0 \Leftarrow P < AC\left(\bar{X}\right) \\ \bar{X} \Leftarrow P \geq AC\left(\bar{X}\right) \end{cases} \tag{5}$$

Figure 2. Firm's Long-run Supply Curve



The long-run market supply curve, obtained by aggregating the firms supply curves, is given by

$$X^s = nX_i^s = \begin{cases} 0 \Leftarrow P < AC(\bar{X}) \\ n\bar{X} \Leftarrow P \geq AC(\bar{X}) \end{cases} \tag{6}$$

OPEN-ACCESS

This section explores the outcome of open-access, i.e. no entry and exit barriers in the industry. Under this scenario, firms enter into the industry when profits are earned and leave when there are losses. The entry of new firms may, however, be limited by restrictions such as land availability with the required characteristics for tourism accommodation facilities. Hereafter, it is assumed that these restrictions are not binding in the open-access equilibrium[1]. Thus, the open-access equilibrium corresponds to

$$\Pi_i\left(\bar{X}\right)=a\left(1-\left(\frac{n}{\bar{n}}\right)^2\right)\bar{X}-c\bar{X}-FC=0 \qquad (7)$$

where Π_i represents the profit of firm i.

This yields the following solution:

$$n^{OA}=\bar{n}\sqrt{\frac{\bar{X}\left(a-c\right)-FC}{a\bar{X}}} \qquad (8)$$

Hence, it can be concluded that the number of firms at the open-access equilibrium increases with $\bar{n}$, $\bar{X}$ and a, and decreases with the cost parameters c and FC.

SOCIAL OPTIMUM

Let us now determine the number of firms and the aggregate level of activity that corresponds to the social optimum. This is obtained, in a static long-run equilibrium analysis, by maximizing the net social benefit $\left(NSB\right)$ of the industry, i.e. the difference between all benefits and costs that it generates to society. In order to isolate the effect of externalities on other activities both its absence and presence will be considered.

Absence of Externalities

As demand is perfectly elastic, and consequently consumer surplus absent, the net social benefit is given by the aggregate economic rent of the industry. The optimum number of firms is, therefore, what maximizes this rent.

$$NSB = n\Pi_i = n\left[a\left(1-\left(\frac{n}{\bar{n}}\right)^2\right)\bar{X} - c\bar{X} - FC\right] \tag{9}$$

The first order condition of the maximization problem is given by

$$\frac{dNSB}{dn} = \Pi_i + n\frac{d\Pi_i}{dn} = \Pi_i + n\left(\frac{dP}{dEQI}\frac{dEQI}{dn}\bar{X}\right) = 0 \tag{10}$$

When a new firm enters the market there are two main effects on the net social benefit. On the one hand, it increases by the profit of the additional firm and, on the other hand, it decreases by the losses that all the other firms incur due to price decrease. The solution of equation (10) is

$$n^* = \bar{n}\sqrt{\frac{\bar{X}(a-c)-FC}{3a\bar{X}}} = \frac{1}{\sqrt{3}}n^{OA} \tag{11}$$

This is the global maximum point, as NSB is a strictly concave function (for positive values of n).

Presence of Externalities

Tourism usually generates a vast set of economic, social and environmental external effects on individuals, firms and governments (Bull 1995). The tourism accommodation industry, in particular, is no exception. It benefits, among others, the activities that provide its intermediate consumptions (e.g. furniture; textiles; food and beverage), the ones used by tourists (e.g. transports; shops; restaurants; bars and entertainment) and the government, through tax revenue. Its main external costs are generally those associated with environmental impacts (e.g. spoiling views and landscapes; noise, air and water pollution) and increased governmental expenditure on public goods (e.g. extra policing; health services and infrastructure maintenance).

In the presence of externalities the net social benefit is obtained by adding external benefits (EB) to the aggregate rent of the industry and subtracting its external costs (EC). Hence,

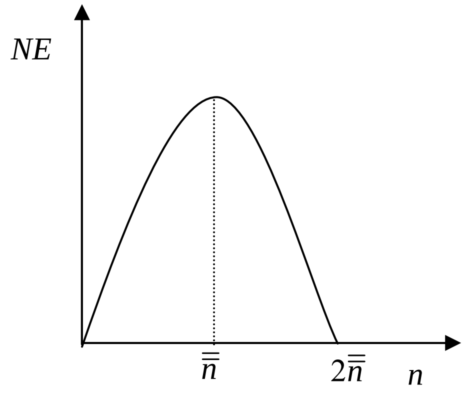
$$NSB = n\Pi_i(n) + EB(n) - EC(n) \tag{12}$$

Hereafter, the difference between external benefits and external costs is defined as net externalities (NE). It is also assumed that net externalities increase at a decreasing rate with the number of firms, until its maximum value is reached, and decrease at an increasing rate thereafter (13). For a small number of firms the net external effect of an additional firm is positive, whereas for a large number of firms the effect is negative. This assumption is a natural corollary of (2), in which environmental quality decreases at an increasing rate with the number of firms.

$$NE(n) = EB(n) - EC(n) = bn\left(2\bar{\bar{n}} - n\right) \tag{13}$$

where $\bar{\bar{n}}$ denotes the number of firms that correspond to the maximum net externalities, and b a function parameter.

Figure 3. Net Externalities



The maximization of NSB, as defined in (12), yields the following first order condition:

$$\frac{dNSB}{dn} = \Pi_i + n\frac{d\Pi_i}{dn} + \frac{dNE}{dn} = 0 \tag{13}$$

Therefore, the entry of an additional firm has three effects on the net social benefit: its own profit, the losses incurred by all other firms due to the price decrease and the additional net externalities generated.

The solution of equation (13) is given by

$$n^{**} = \bar{n}\sqrt{\frac{\bar{X}\left(a-c\right) - FC + 2b\bar{\bar{n}}}{3a\bar{X}} + \frac{b^2\bar{n}^2}{9a^2\bar{X}^2}} - \frac{b\bar{n}^2}{3a\bar{X}} \tag{14}$$

This is also the global maximum point as NSB remains a strictly concave function (for positive values of n).

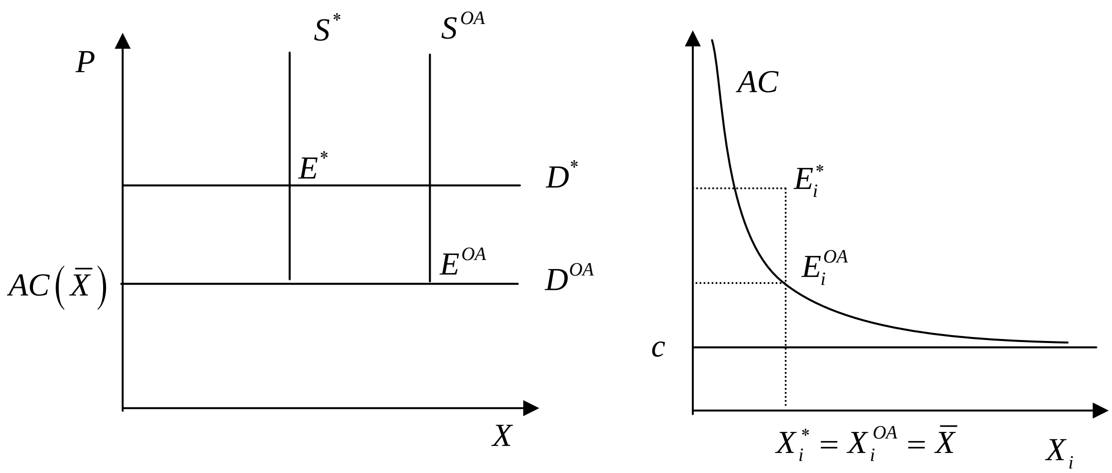
OPEN ACCESS VERSUS SOCIAL OPTIMUM

In this section open access and social optimum solutions, in the absence and presence of externalities, are compared. The analysis is undertaken assuming that if there is only one firm in the market it will have positive economic returns[2].

Absence of Externalities

From the equations that define the long-run equilibria it can be concluded that the social optimum is characterized by lesser firms, receiving higher price and earning higher profits, and lesser aggregate output, when compared with the open access. Figure 4 illustrates these outcomes.

Figure 4. Market and Firm Long -run Equilibria



D and S represent market demand and supply, respectively; E and E_i market and firm equilibrium; and the indices $*$ and OA denote social optimum and open-access.

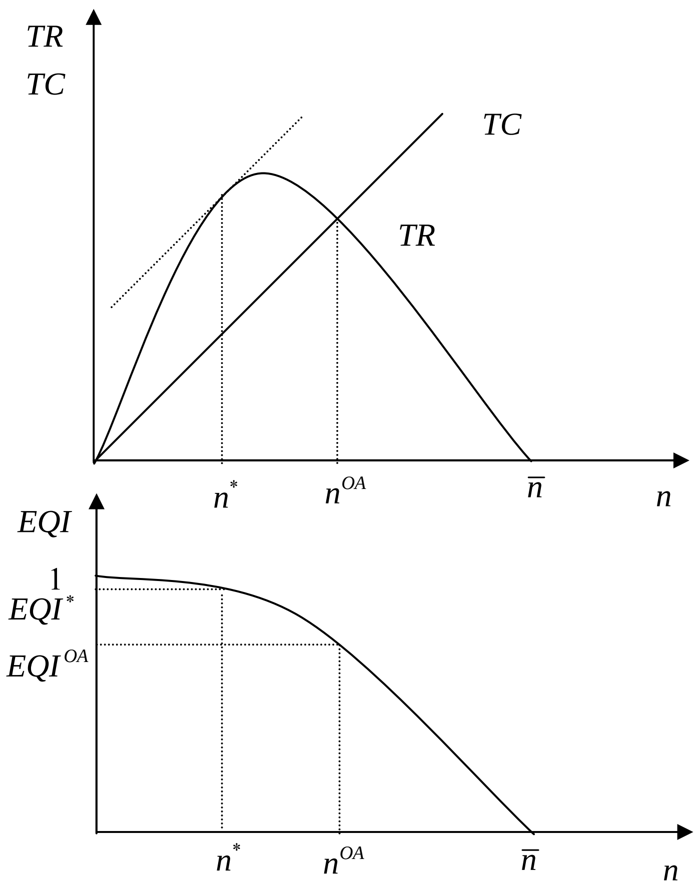
Let us further explore the relation between the number of firms and the economic yield. For that let the aggregate total revenue and aggregate total cost be defined, respectively, as

$$TR\left(n\right) = P(n)n\overline{X} = \frac{a\overline{X}}{\overline{n}^2}n\left(\overline{n}^2 - n^2\right) \tag{15}$$

$$TC\left(n\right) = n\left(c\overline{X} + FC\right) \tag{16}$$

For positive values of n, TR is a concave function, with a maximum point at $n = \frac{\overline{n}}{\sqrt{3}}$ and TC is a linear function. Figure 5 shows these functions as well as the open-access and social optimum solutions.

Figure 5. Open Access and Social Optimum Solutions



The first graph of Figure 5 resembles the classic Gordon-Schaefer model (Gordon 1954) which shows the problem of economic over-fishing in the open-access regime. Like the Gordon-Schaefer model, the present model of the tourism accommodation industry is also centred on a common pool resource (environmental quality) and the intensity of its use (measured by the number of firms). As Figure 5 illustrates, although total output is greater in open access than in the social optimum solution, the latter not only yields higher economic rent but can also yield higher revenue.

The model shows that open-access is clearly inefficient. It leads to both economic and environmental over-exploitation, as a decrease in the number of firms simultaneously produces an increase in the net social benefit and environmental quality.

Presence of Externalities

The relation between the number of firms that maximizes net social benefits in the presence and in the absence of externalities (n^{**} and n^{*}, respectively) can be represented as follows.

$$\begin{cases} n^{**} < n^{*} \Leftarrow n^{*} > \bar{\bar{n}} \\ n^{**} = n^{*} \Leftarrow n^{*} = \bar{\bar{n}} \\ n^{**} > n^{*} \Leftarrow n^{*} < \bar{\bar{n}} \end{cases} \tag{17}$$

Hence the relation between the two optimal solutions depends on the relation between the number of firms that correspond to the industry's maximum aggregate rent and maximum net externalities. In particular, if the number of firms that maximizes the industry's aggregate rent is greater than the number that maximizes net externalities, the optimum number of firms in the presence of externalities is less than in its absence.

Regarding the relation between the optimal number of firms in the presence of externalities and the number of firms in the open-access equilibrium, the following proposition can be established.

Proposition 1. A necessary condition for optimum number of firms in the presence of externalities to be equal or greater than the number of firms at the open-access equilibrium $\left(n^{**} \geq n^{OA}\right)$ is that the number of firms that corresponds to maximum net externalities exceeds the number of firms at the open-access equilibrium $\left(\bar{\bar{n}} > n^{OA}\right)$.

Proof.

This proposition can be proven easily by contradiction. Suppose that $\bar{\bar{n}} \leq n^{OA}$, this implies that $\frac{dNSB}{dn}\left(n^{OA}\right) = \frac{d\Pi}{dn}\left(n^{OA}\right) + \frac{dNE}{dn}\left(n^{OA}\right) < 0$. Therefore, as NSB is a concave function $n^{**} < n^{OA}$. ■

The necessary condition stated in Proposition 1 is generally not verified when the tourism industry presents relevant environmental impacts, especially in the case where environmental quality decreases at an increasing rate with the number of firms. Hence, apart from very specific situations where positive externalities are very significant, compared with the industry's aggregate rent and its negative externalities, open-access leads to an inefficient solution where the number of firms exceeds the social optimum, as in the absence of externalities.

POLICY ANALYSIS

The tourism literature on common-pool resources suggests a few approaches to take its use from open-access to the social optimum. According to Healy (1994) that can occur under different property rights regimes, pure or mixed, such as private, governmental and common.

In the case of the tourism accommodation industry, most environmental commons (such as views, water and air quality and site sanitation) are public goods, which cannot, generally, be privatised. The common management of these resources is also impaired by the threat of new entrants – which will be attracted to the industry whenever it presents an economic rent. Thus, governmental management is required in order to steer the industry to the social optimum. This can be done through two complementary strategies: limiting the number of firms and minimizing their environmental impacts. The number of firms can be limited through a variety of policy instruments, namely: limiting land use, issuing a limited number of permits to operate in the market, restricting the number of visitors, and taxing the industry. A brief discussion of these instruments is now undertaken.

Limiting land use, through a spatial planning, is usually the key procedure to take the tourism accommodation industry away from open-access. It simultaneously limits the number of firms that can operate, co-ordinates tourism with other activities and guarantees the preservation of natural, built and socio-cultural resources (Collins 1999).

By issuing a number of permits equal to the social optimum number of firms an economic rent is created in the industry. Furthermore, by allowing permits trade, efficiency can be enhanced, as only the more efficient firms remain in the market. The mechanisms used to attribute these permits can, however, have very distinct distributive effects. The regulatory entity can, for example, issue the permits free of charge or auction it off. In the former case, firms that receive permits earn a valuable asset, whereas in the latter they have to pay for it.

An indirect way of limiting the number of firms is by restricting the number of visitors. An example of this policy is the limit on the number of tourists adopted by the Bhutan government.

Taxing is also an alternative form of restricting the number of firms. For example, a special tax levied on overnight accommodation would shrink the market supply and raise funds, which could be used for environmental conservation. Healy (1994) refers that this type of tax has been applied in some countries, though its revenues mostly spent in tourism promotion.

In order to minimize the industry’s environmental impacts, limits should be set on building density, height and architectural style. Moreover, environmental friendly practices should be promoted.

The aforementioned governmental policies should aim not only to attain economic efficiency but also to ensure the sustainable development of the tourism destination. According to Briassoulis (2002), this requires an adaptive resource management paradigm in which there is wide stakeholder participation, frequent monitoring and revision of management practices.

The environmental commons related to the tourism accommodation industry are part of a complex system of actors, actions and resources – the tourism destination. Therefore, its management should be integrated in the overall destination management. For integrated management to be successful, direct involvement of the local community is a crucial factor (Manente and Minghetti 2005). Some authors (e.g. Jamal and Jamrozy 2005) argue that traditional tourism organizational structures tend to deal separately with issues such as: destination marketing, land use and conservation. Thus, integrated tourism management requires new organizational structures. Creating Destination Management Organizations, or extending the roles of existing ones, figure among the most important alternatives.

CONCLUSION

This paper models the tourism accommodation industry which impacts and depends on environmental quality. The main conclusion is that open-access generally leads to both economic and environmental over-exploitation, i.e. "the tragedy of the commons". This also affects the overall tourism industry, as tourism accommodation and environmental quality play central roles in it. Basically, it leads to mass tourism characterized by tourists with low willingness to pay – typically low purchasing power tourists. The pattern of development of many tourism destinations worldwide, and in particular in the Mediterranean coastline, clearly fits in this picture.

The present research shows that tourism can destroy tourism. This is also emphasized by Tisdell (2005) when crowding from a large number of tourists deters other tourists from visiting the site or when tourism damages assets which attract tourists.

The model results emphasize that firms' entry should generally be limited, not only on the grounds of efficiency but also on sustainability. The exceptions are the cases where positive externalities are very significant, compared to the industry's aggregate rent and its negative externalities, or when there are binding restrictions, such as land availability, in the open-access equilibrium. Aside from these specific situations, the open-access equilibrium is inefficient, compared to the social optimum solution, as it leads to the dissipation of economic gains and loss of environmental quality. It is also unsustainable as it compromises the well being of future generations, both in economic and environmental dimensions.

Externalities, which are very common in the tourism accommodation industry, should be considered when setting its social optimum solution. Nonetheless, in its presence, the optimum number of firms is also generally below the open access equilibrium. Thus, the need for limited entry regulations remains, although its magnitude may differ from the case where externalities are not present.

The interdependency between tourism and the environment is very complex. This paper only explores the case in which tourism development leads to a decrease in environmental quality. However, as Tisdell (2001) stresses, a properly planned and regulated tourism can, however, foster environmental conservation in order to obtain economic gains from tourists. The achievement of this goal depends on the type of tourism and the adequacy of the overall planning associated with it. The modelling of this situation is a natural avenue for further research. Another possible extension is to consider firms' investments on environmental innovations and the consequent impacts on environmental quality and firms' profits. Finally, a dynamic modelling approach could be adopted in order to explore such aspects as the intertemporal distribution of costs and benefits.

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[1] If the restrictions were binding firms would earn positive profits in the open-access equilibrium. This equilibrium could also coincide with the social optimal solution.

[2] This assumption rules out the trivial case in which one firm is both the open-access equilibrium and the optimal solution.