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XARXA DE REFERÈNCIA EN ECONOMIA APLICADA

The commons and anti-commons problems in the tourism economy

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Countries specialised in tourism tend to face two problems with contradictory effects: the commons and the anti-commons, which lead to tourism over- and under-production, respectively. This paper develops a two-period model to analyse the joint effects of both problems on a small and remote tourism economy. Congestion and the complementariness between foreign transport and local tourism services are key features in this type of markets. As a result, direct selling and the presence of foreign tour-operators emerge as possible market arrangements with different implications in terms of welfare and public intervention. Four main results are obtained. First, in the direct selling situation the optimal policy depends on the relative importance of the problems. Second, the existence of tour-operators always leads to tourism over-production. Third, the presence of a single tour-operator does not solve the congestion problem. Lastly, the switch from several tour-operators to a single one is welfare reducing.

Keywords: commons; anti-commons; tourism; direct selling; tour-operators; optimal policy

(Palabras clave: comunes; anti-comunes; turismo; venta directa; turoperadores; política óptima)

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Introduction

Countries with the highest degree of specialisation in tourism tend to be small and remote, most of them being island countries (e.g. Brau et al., 2007). Four important consequences can be drawn from these features. First, the local tourism industry is highly dependent on air transport; this is why they have been a preferred choice for international tour-operators. Second, they are perceived by tourists as differentiated products, which confer them with market power.[1] Third, their economic performance has a negligible impact on international markets. Lastly, the massive tourist arrivals to these small countries and the consequent tourism expansion intensify the use of common resources.

In this paper we study, at a theoretical level, the effects of the so-called commons and anti-commons problems on the aggregate equilibrium of a tourism economy characterised by the aspects just described. These problems are market failures, so they impinge on factor allocation and welfare. Our aim is to analyse those effects along with the required public intervention to achieve a local optimum. The local optimum is not Paretian because the local government has incentives to use the market power of the economy in the tourism markets (e.g. Donnenfeld, 1983).

It is pertinent to remember what is understood by the commons and anti-commons problems. The well-known problem of the commons arises provided that the property rights are not clearly assigned and hence private costs underestimate social costs, which results in over-production. In our analysis the commons problem will consist of a congestion problem, and not of the *tragedy of the commons.*[2] In addition, tourism goods, such as transport services and tourism goods provided at the destination,

[1] These two implications were pointed out by Hernández-Martín (2008). Regarding the second implication, the empirical evidence by Prieto-Rodríguez and González-Díaz (2008) showed that there is an economic rent for hotels in tourism islands.

[2] The well-known *tragedy of the commons* is referred to the exhaustion of a common resource due to overuse.

exhibit a high degree of complementariness, so the tourism basket can be combined as a package. Accordingly, the tourist would care about the package price instead of each service price. Candela et al. (2008) were the first in using the concept of anti-commons to analyse tourism markets, while this concept was introduced in the field of Law and Economics by Michelman (1982). In their analysis of local tourism systems, Candela et al. (2008) showed that when these goods are produced under imperfect competition the anti-commons problem may emerge. This problem appears as long as there is no coordination among the firms in making their decisions. As a consequence, each industry charges its own mark-up, which leads to a higher package price and a smaller tourism production than if a unique mark-up was charged on the package price.

For accomplishing our goal, we develop a two-period model that represents the aggregate behaviour of a tourism economy that faces exogenous tourism demands, and enjoys market power in its export markets.[3] The framework is based on the following assumptions. The economy produces non-traded consumption goods and traded tourism services. There are two factor inputs: capital that is allocated to both sectors, and a common resource that is only used by the tourism sector. Capital fully depreciates at the end of each period, and hence in the first period it must be allocated to both sectors, while in the second period it is entirely allocated to producing consumption goods and the tourism production is nil. The revenues from the tourism exports in the first period pay for the imports of capital goods for the next period.[4] In the tourism sector there is an external effect related to the industry's production, which stands for the congestion problem provoked by the use intensity of the common resource. In addition, the tourists

[3] A two-period model is enough to illustrate the ideas that we develop in this paper. Furthermore, this structure is quite convenient for the analysis of optimal policies, since it allows the changes in welfare to be easily computed (e.g. Huizinga, 1995).

[4] The positive role for economic growth of using the tourism revenues to import capital goods was showed, both theoretically and empirically, by Nowak et al. (2007). Moreover, the empirical evidence by Holzner (2005) has also revealed that the tourism countries tend to have high investment and economic growth.

need to buy transport services to reach the destination. These services are produced at zero cost by foreign firms that also enjoy market power. The transport and the local tourism services are perfect complementary, so the tourism basket can be combined as a package. Lastly, there is a government in the economy with the aim of maximising welfare of the local population.

There is an underlying question to the presence of complementariness, namely how the total surplus generated by both industries is split off between the foreign and the local firms. The split off is critical for the tourism economy providing it impinges on capital allocation and the tourism revenues. The answer depends on whether firms make their decisions independently or jointly. Regardless the type of market arrangement, we show that the government's strategy for maximising welfare is to behave as a price-leader, in the sense of computing the local residual tourism demand and then maximising the social profits. The reason is quite simple: the economic rent is resource saving.

In this framework we begin by studying the situation of direct selling wherein the local and the foreign firms make their decisions independently. Our findings reveal that it would become optimal to tax the local tourism price whenever the commons problem overcame the anti-commons problem. When the opposite applies, subsidising will become optimal. The next step in our analysis is to allow for the emergence of tour-operators. The literature on industrial organisation shows that the joint maximisation of profits is a solution for the anti-commons problem, provided that a unique mark-up is charged (e.g. Andreiychencko et al., 2006). In the tourism markets this task is carried out by the tour-operators. They choose the package prices and productions that maximise the total surplus, and then the surplus is share out between the tour-operators and the local firms through negotiation processes. In this respect, our analysis is based

on the sensible assumption that only the foreign transport firms can act as tour-operators.

From the firms' point of view the joint maximisation of profits would be a solution for the anti-commons problem, but not from the perspective of the tourism economy. This is because the maximisation of the total surplus does not imply the maximisation of profits earned by the tourism country. Moreover, the commons problem remains unsolved, and hence a public intervention is required in order to reduce the tourism production. These findings seem to suggest that the presence of a unique tour-operator could be a solution for the congestion problem, given that this firm would control the aggregate tourism production. We show that, from the tourism economy's point of view, this argument is not correct. Indeed, a standard result in the literature on industrial organisation is that the joint maximisation of profits may imply that one of the goods is priced below its marginal cost. Therefore, once again a public intervention is needed to reduce the tourism production.

Our last finding refers to the changes in welfare provoked by the switch from several tour-operators to a single one. One could think of the presence of a unique tour-operator as being welfare improving as long as it considers the social marginal costs. However, we find quite the opposite, the reason lying in the effects on the local residual tourism demand. The local tourism price is equal to the average costs plus a proportion of the total surplus per production unit. Such a proportion represents the negotiation power of local firms. The switch increases the total surplus, thus provoking a rise in the local tourism price. But it also lowers the average costs, which leads to a reduction in the local tourism price. Under the plausible assumption that the negotiation power remains the same (or becomes smaller) the latter effect overcomes the former one, and a

contraction of the local residual tourism demand, and hence in the tourism revenues, takes place. The overall result is a reduction in welfare.

The main message from this paper is that foreign tour-operators and tourism destinations do not have the same objectives, so their views about the solution of the commons and anti-commons problems differ substantially. In this respect, there are voices claiming for a greater involvement of international tour-operators in the administration of commons resources in the tourism destinations (e.g. Budeanu, 2003). We are not radically against that claim. What we aim is to warn on the fact that the tour-operators care about their profits and not about welfare in the tourism destinations. The ones in charge of achieving the maximum welfare level should be the local governments.

The rest of the paper is organised as follows. The second section describes the environment. The direct selling situation is studied in the third section. The emergence of tour-operators is discussed in the fourth section. The two subsequent sections analyse the situations with several tour-operators and a single tour-operator, respectively. Finally, the last section summarises and concludes.

The environment

Our simple theoretical framework represents the aggregate equilibrium of a two-period tourism economy that enjoys market power in the tourism markets. The time period is denoted as $t = 0,1$. The tourism destination produces a large number m of traded tourism good varieties, x_t^i, $i = 1,2,...,m$, and a non-traded good of consumption, Y_t. There are two factor inputs: physical capital, K_t, that is used in both sectors and depreciates fully; and a common resource, R, that is only used by the tourism sector. In period 0 the revenues from tourism exports pay for the imports of capital goods for the

next period. Hence, in period 1 the tourism production is nil and capital is entirely allocated to the consumption goods sector. In every period, the country is inhabited by a continuum of measure one of identical households. From now on, it should be kept in mind that the capital goods will be taken as numeraire, and that the variables will be expressed in per capita terms of the tourism economy.

The tourists come from a large number n of origins, denoted by $j = 1,2,...,n$. Moreover, they must buy transport services to reach the destination. We assume that transport and tourism services at the destination are perfect complementary, so the tourism basket can be combined as package. The transport services are supplied by foreign firms because the tourism economy does not have comparative advantage in the production of those services.

Next, we describe the environment with detail.

The consumption goods sector in the tourism economy

There is a continuum of measure one of competitive firms that produce consumption goods with the AK technology:

$$Y_t = K_{Y,t}, \tag{1}$$

where $K_{Y,t}$ denotes physical capital allocated to the sector. The representative firm chooses capital as to maximize the profits $\Pi_{Y,t} = \left(p_t - \left(r_t + 1 \right) \right) K_{Y,t}$, where p_t is the consumption goods price, r_t is the interest rate and the depreciation rate of capital is equal to the unity. The maximisation of profits yields:

$$p_t = r_t + 1. \tag{2}$$

The demands of transport and local tourism services

By simplicity, we assume that the tourism market is organised in independent segments according to tourist' features. More specifically, each type of tourist is denoted by the pair (i, j), which means that she demands local tourism good i and comes from origin j. Therefore, there are $m \times n$ types of tourists. The tourism basket purchased by the tourist of type (i, j) costs $q_0^{i,j}$ units of capital good:

$$q_0^{i,j} = q_{L,0}^{i,j} + q_{F,0}^{i,j}, \tag{3}$$

where $q_{L,0}^{i,j}$ denotes the price of local tourism goods and $q_{F,0}^{i,j}$ is the price of foreign transport services. The equation (3) implies that the transport and the local tourism goods are combined in a one-to-one relationship. We formulate the demands as:

$$x_0^{i,j} = \left(q_{L,0}^{i,j} + q_{F,0}^{i,j}\right)^{-\sigma},\ i = 1,2,...,m,\ j = 1,2,...,n,\ \sigma > 1, \tag{4}$$

where $x_0^{i,j}$ is the demanded amount of transport and local tourism services, and hence of tourism baskets, of type (i, j).

The government in the tourism economy

There is a public planner or government in the tourism economy with the objective of correcting the undesirable effects of commons and anti-commons problems on the social welfare. In doing so, it uses ad-valorem taxes/subsidies and flat transfers/taxes as policy instruments. More specifically, for reducing the tourism production it collects ad-valorem taxes on the local tourism price, with tax rate $\tau > 0$, and distribute the tax revenues among the families in the form of flat transfers, $T_0 > 0$, in order not to introduce further distortions. Conversely, for increasing the tourism production it grants the local tourism firms with ad-valorem subsidies on the local tourism price, $\tau < 0$, that

are financed with flat taxes paid by the households, $T_0 < 0$. The public budget is always balanced:

$$\tau \sum_{i=1}^{m} \sum_{j=1}^{n} q_{L,0}^{i,j} x_0^{i,j} = T_0. \tag{5}$$

The local tourism sector

Each firm retains monopoly power on its market segments. The firm i sells its services to tourists from all origins, so it faces n demands. The production function of firm i is:

$$x_0^i = \frac{R}{X_0^{\varepsilon}} k_{x,0}^i, \quad X_0 \equiv \sum_{i=1}^{m} x_0^i = \sum_{i=1}^{m} \sum_{j=1}^{n} x_0^{i,j}, \ \varepsilon > 0, \tag{6}$$

where x_0^i is the production of tourism good i, and $k_{x,0}^i$ denotes the capital devoted to produce it. Thus, the total capital used by the sector is equal to $K_{X,0} = \sum_{i=1}^{m} k_{x,0}^i$. The variable X_0 is the industry's production, and the term $X_0^{-\varepsilon}$ is an external effect that represents the use intensity of the fixed factor R. This simple formulation stands for the congestion problem generated by a tourism expansion, which decreases productivity and raises the production costs. Therefore, there are constant returns to capital at the firm (private) level, while the returns are decreasing at the industry (social) level. Taking into account the equation (6) and the public intervention, the cost function of firm i becomes:[5]

$$e_0^i = (r_0 + 1) \frac{X_0^{\varepsilon}}{R} x_0^i + \tau \sum_{j=1}^{n} q_{L,0}^{i,j} x_0^{i,j}. \tag{7}$$

[5] In order to simplify notation, the equilibrium result of interest rate equalisation has been already introduced.

The foreign transport sector

The transport services are produced at zero cost. We will work under two different assumptions. First, in each origin there is a unique provider of transport services that retains monopoly power in its market. Second, there is a unique monopoly that provides services to all origins.

The households in the tourism economy

The representative household derives utility from consumption and seeks to maximise the total discounted utility:

$$U_0 = Ln|C_0| + \beta Ln|C_1|,\ \beta > 0. \tag{8}$$

At the initial period, the representative household is endowed with $K_0 > 0$ units of capital, earns capital income and profits, and either receives transfers or pays taxes. The income is then divided into consumption expenditure and savings or capital for the next period. In period 1, the capital income is used to purchase consumption goods. The budget constraints can be then written as:

$$p_0 C_0 + K_1 \le (1 + r_0) K_0 + \Pi_{L,0} + T_0, \quad p_1 C_1 \le (1 + r_1) K_1, \tag{9}$$

where $\Pi_{L,0} = \sum_{i=1}^{m} \pi_{L,0}^{i}$ represents the profits from the local tourism sector. The solution of this problem implies that:

$$p_1 C_1 = \beta (1 + r_1)\, p_0 C_0. \tag{10}$$

Direct selling

We begin by analysing the direct selling situation, in which the local and the foreign firms make their decisions independently and sell their productions directly to the tourists.

The problems of local and foreign firms

Considering the demands in (4), the local firm i chooses the tourism prices as to maximise the sum of profits from the n different origins:

$$\underset{\left\{q_{L,0}^{i,j}\right\}_{j=1,2,...,n}}{max} \quad \pi_{L,0}^{i} = \sum_{j=1}^{n} \pi_{L,0}^{i,j} = \sum_{j=1}^{n} \left(\left(1-\tau\right) q_{L,0}^{i,j} - \left(r_0+1\right) \frac{X_0^{\varepsilon}}{R} \right) x_0^{i,j}, \tag{11}$$

while the foreign firm j decides on the transport prices as to maximise the sum of profits from the m types of tourists:

$$\underset{\left\{q_{F,0}^{i,j}\right\}_{i=1,2,...,m}}{max} \quad \pi_{F,0}^{j} = \sum_{i=1}^{m} \pi_{F,0}^{i,j} = \sum_{i=1}^{m} q_{F,0}^{i,j} x_0^{i,j}. \tag{12}$$

The resolution of problems in (11) and (12) yields two reaction functions that show how the local and the foreign firms charge their own mark-up $q_0^{i,j}/\sigma$. The lack of coordination among the industries brings about the well-known problem of double marginalisation:

$$q_{L,0}^{i,j} - \frac{r_0+1}{1-\tau} \frac{X_0^{\varepsilon}}{R} = \frac{q_0^{i,j}}{\sigma}, \quad q_{F,0}^{i,j} = \frac{q_0^{i,j}}{\sigma} \quad \rightarrow \quad q_0^{i,j} - \frac{r_0+1}{1-\tau} \frac{X_0^{\varepsilon}}{R} = \frac{2}{\sigma} q_0^{i,j}. \tag{13}$$

The tourism basket and the prices of local tourism and transport are obtained from the equations in (13):

$$q_0^{i,j} = \frac{\sigma}{\sigma-2} \frac{r_0+1}{1-\tau} \frac{X_0^{\varepsilon}}{R}, \quad q_{L,0}^{i,j} = \frac{\sigma-1}{\sigma-2} \frac{r_0+1}{1-\tau} \frac{X_0^{\varepsilon}}{R}, \quad q_{F,0}^{i,j} = \frac{1}{\sigma-2} \frac{r_0+1}{1-\tau} \frac{X_0^{\varepsilon}}{R}. \tag{14}$$

Looking at the demands in (4) and the results in (14), it follows that the equilibrium is symmetrical and hence the superscripts i and j can be removed. This feature will remain unchanged throughout the paper. The aggregate tourism production can be obtained adding up all demands defined in (4) and introducing the tourism basket price in (14):

$$X_0 = (mn)^{\frac{1}{1+\sigma\varepsilon}} \left(\frac{\sigma-2}{\sigma} \frac{1-\tau}{r_0+1} R \right)^{\frac{\sigma}{1+\sigma\varepsilon}}. \tag{15}$$

Lastly, the aggregate profits earned by the local and the foreign firms can be calculated adding up the profits in (11) and (12) over local tourism goods and origins, respectively, and substituting (14) and (15):

$$\Pi_{L,0} = \frac{r_0+1}{\sigma-2} \frac{(mn)^{\frac{1+\varepsilon}{1+\sigma\varepsilon}}}{R} \left(\frac{\sigma-2}{\sigma} \frac{1-\tau}{r_0+1} R \right)^{\frac{\sigma(1+\varepsilon)}{1+\sigma\varepsilon}}, \quad \Pi_{F,0} = \frac{\Pi_{L,0}}{1-\tau}. \tag{16}$$

The analysis hitherto shows that the necessary condition for the direct selling to be feasible is $\sigma > 2$. The reason lies in the double mark-up charged on the package price: there would be no room for a double mark-up if the price elasticity of the demand for tourism baskets was smaller than two. Throughout this section we will assume that the direct selling is workable.

The aggregate equilibrium of the tourism economy

Some straightforward manipulations of the equations (2), (9) and (10), (14) and (15) yield the aggregate equilibrium conditions $p_0 = \frac{\sigma-2}{\sigma}(1-\tau) R (mn)^{\frac{1}{\sigma}} X_0^{-\frac{1+\sigma\varepsilon}{\sigma}}$, $p_1 = 1$, $C_0 = K_0 - K_{X,0}$ and $C_1 = K_1 = q_{L,0} X_0 = \beta p_0 C_0$ from which the factor allocation and hence tourism production are obtained:

$$K_{X,0}^{DS} = \frac{\left(X_0^{DS}\right)^{1+\varepsilon}}{R} = \frac{\beta K_0}{\frac{\sigma-1}{\sigma-2}\frac{1}{1-\tau} + \beta}. \tag{17}$$

where the superscript DS indicates direct selling. Considering the equilibrium conditions and the tourism production in (17), we get the consumption levels in periods

0 and 1, the aggregate profits earned by the local firms and the foreign firms, and the local tourism price:

$$q_{L,0}^{DS} = \frac{\sigma - 1}{\sigma}(mn)^{\frac{1}{\sigma}}\left(X_0^{DS}\right)^{-\frac{1}{\sigma}}. \tag{18}$$

The equation (18) is the local residual tourism demand arising after the transport firms have maximised their profits, which coincides with the marginal income of tourism baskets.

The local optimum

The presence of the commons and anti-commons problems might justify a public intervention with the aim of achieving the local optimum. This optimum is not Paretian because the local government has incentives to use the market power of the economy in the tourism markets. These incentives come from the fact that, owing to its small size, the resource allocation in the tourism economy has a negligible impact on the international markets of capital goods. Moreover, in defining the policy, the local planner is restricted by the tourism market structure. In this regard, the direct selling implies the existence of duopoly relationships with simultaneous price determination in each market segment.

The objective function of the government is welfare, which comes from introducing the equilibrium expressions of consumption in periods 0 and 1 into the utility function in (8). The solution of the planner's problem yields the optimal tax/subsidy rate:

$$\tau^{DS} = 1 - \frac{\sigma - 1}{\sigma(1+\varepsilon)}\frac{\sigma - 1}{\sigma - 2} \begin{matrix} > \\ = \\ < \end{matrix} 0. \tag{19}$$

Substituting τ^{DS} in (17) we obtain the optimal factor allocation and tourism production:

$$\tilde{K}_{X,0}^{DS} = \frac{\left(\tilde{X}_0^{DS}\right)^{1+\varepsilon}}{R} = \frac{\beta K_0}{\frac{\sigma(1+\varepsilon)}{\sigma-1}+\beta}, \tag{20}$$

Here and throughout the paper the tilde will indicate values in the local optimum. From the equation (19) three cases can be distinguished, which rely on the relative importance of the commons and anti-commons problems. The conditions under which each of these cases emerge can be better understood by looking at the rules for maximising profits at an aggregate level displayed in the Figure 1. Notice that in the figure the price of the consumption goods is taken as given.

FIGURE 1 ABOUT HERE

The aggregate tourism production when no policy is implemented, X_0^{DS}, comes from equalising the sum of local and foreign marginal incomes (MIFL) and the private marginal costs, which coincide with the average costs (AC). The price of tourism baskets, q_0^{DS}, is obtained substituting that production into the demand of tourism baskets (DTB). As we discussed before, the local tourism price, $q_{L,0}^{DS}$, becomes equal to the marginal income of tourism baskets (MITB). The latter result has a significant implication, namely the local optimum needs the maximisation of profits earned by the tourism economy or social profits, defined as the difference between the aggregate tourism revenues and the social costs, $q_{L,0}X_0 - p_0 X_0^{1+\varepsilon}/R$, where $q_{L,0}$ is given by the demand defined in (18). Consistently, the optimal tourism production, $\tilde{X}_0^{DS}$, requires the equalisation of marginal income of local tourism services (MILTS) and the social marginal costs (SMC). The local tourism price, $\tilde{q}_{L,0}^{DS}$, is then obtained from the local residual tourism demand (MITB).

The government follows a price-leader strategy, since it lets the foreign firms maximise their profits, computes the local residual tourism demand and then maximise

the social profits. This sequential strategy implies the existence of two mark-ups on the price of tourism baskets:

$$\tilde{q}_0^{DS} - p_0\left(1+\varepsilon\right)\frac{\left(\tilde{X}_0^{DS}\right)^{\varepsilon}}{R} = \underbrace{\frac{2}{\sigma}\tilde{q}_0^{DS}}_{DTB-MIFL} - \underbrace{\frac{1}{\sigma^2}\tilde{q}_0^{DS}}_{MILTS-MILF} . \tag{21}$$

The comparison of the equations in (13) (after setting $\tau = 0$ and $r_0 + 1 = p_0$) and (21) shows two changes introduced by the policy regarding the mark-up charge on the price of tourism baskets, or total mark-up. First, it reduces the total mark-up by the amount $1/\sigma^2\ \tilde{q}_0^{DS}$, which operates decreasing the price and increasing the tourism production; this is the way of dealing with the anti-commons problem. Second, the marginal cost considered is the social one, which raises the price and diminishes the production; this indicates that the congestion problem has been fixed.

The policy depends on the relationship between the social marginal costs (SMC) and the marginal income of local tourism services (MILTS). Indeed, the local government will find optimal to reduce the tourism production whenever the direct selling equilibrium implies that the marginal income is smaller than the social marginal costs. It could be also the case that both coincide, and hence no welfare gains will be reached from changing the tourism production. Lastly, as illustrated in the Figure 1, the maximisation of welfare will entail an increase in production whenever the marginal income overcomes the social marginal costs. In the first case, the implementation of the local optimum as a decentralised equilibrium requires the introduction of an ad-valorem tax, $\tau^{DS} > 0$, which acts increasing the private marginal costs. In the second case no public policy is needed, $\tau^{DS} = 0$. Lastly, an ad-valorem subsidy, $\tau^{DS} < 0$, which reduces the private marginal costs (MCP in the figure), allows the optimal tourism production to be reached.

The emergence of tour-operators

The anti-commons problem is understood as the under-production provoked by the absence of coordination between firms that have market power and produce complementary goods. From the point of view of the literature on industrial organisation, that is, from the firms' perspective, the joint maximisation of profits allows this problem to be solved. In the tourism markets this maximisation is carried out by the tour-operators. Here, we will assume that the foreign transport firms act as tour-operators, and neither the local tourism firms nor the local government can undertake this task. The tour-operators purchase the tourism production to the local firms, construct tourism packages and sell them to the tourists. We will follow the literature on transfer prices (e.g. Raper et al., 2000) and assume a two-step process in the determination of package productions and prices and the split off of the ensuing surpluses. In the first step the tour-operators choose the package prices and productions as to maximise the joint profits. Then, the total surplus is split off between the parties through bilateral negotiations on transfer prices or local tourism prices. The share out of profits relies on the negotiation power of the parties, which will be exogenously given.

The presence of tour-operators requires the contracts to be mutually beneficial for the parties, in the sense that the profits earned by the tour-operators and the local firms should be equal to or greater than those obtained in a direct selling situation. Since in our framework there is an external effect associated with congestion, the emergence of tour-operators is not guaranteed. Therefore, before going on with the analysis, we must establish the necessary (but not sufficient) condition for the equilibrium with tour-operators to exist. Such a condition is nothing but the possibility of increasing the total surplus by means of the joint maximisation of profits. The total profits might rise whenever the marginal income of tourism packages was smaller than the social

marginal costs. Therefore, from now on, we will assume that the next relationship holds:[6]

$$\frac{\sigma-1}{\sigma}(mn)^{\frac{1}{\sigma}}\left(X_0^{DS}\right)^{\frac{\sigma-1}{\sigma}} > (1+\varepsilon)\frac{p_0^{DS}}{1-\tau}\frac{\left(X_0^{DS}\right)^{\varepsilon}}{R} \quad \rightarrow \quad \varepsilon < \frac{1}{\sigma-2}. \tag{22}$$

This arrangement implies that the foreign firms have monopsony power in buying local tourism services and monopoly power in selling tourism packages. Additionally, every local firm acts as a monopoly in the markets of its tourism good. Therefore, the market structure entails bilateral monopoly-like relationships (e.g. Blair and Kaserman, 1987). In the next subsequent sections, we will study the case with several tour-operators and that with a unique tour-operator, respectively. The study of the latter case is pertinent as long as it implies that the tour-operator can make decisions on the whole tourism production and hence deal with the congestion problem.

Several tour-operators

Since the agents' decisions are based on rational expectations, the local and the foreign firms make an accurate prediction of profits associated to any general equilibrium, and hence their decisions on whether or not to sign a contract turn out to be correct.

The tour-operators' problem and the negotiation processes

In the first step, the foreign firm in origin j faces m demands of tourism packages and chooses m package prices as to maximise the total profits:

$$\max_{\left\{q_0^{i,j}\right\}_{i=1,2,..,m}} \sum_{i=1}^{m}\left(\frac{\pi_{L,0}^{i,j}}{1-\tau}+\pi_{F,0}^{i,j}\right) = \sum_{i=1}^{m}\left(q_0^{i,j}-\frac{r_0+1}{1-\tau}\frac{X_0^{\varepsilon}}{R}\right)\left(q_0^{i,j}\right)^{-\sigma}, \tag{23}$$

[6] Note that $q_{L,0}^{DS} = \frac{\sigma-1}{\sigma}(mn)^{\frac{1}{\sigma}}\left(X_0^{DS}\right)^{\frac{\sigma-1}{\sigma}} = \frac{\sigma-1}{\sigma-2}\frac{p_0^{DS}}{1-\tau}\frac{\left(X_0^{DS}\right)^{\varepsilon}}{R}$.

where the local profits have been adjusted to account for the public policy. Notice that the foreign firm pays a price $q_{L,0}^{i,j}$, and consequently the local firm receives a part $\pi_{L,0}^{i,j}/(1-\tau)$ of the total surplus that corresponds to the market segment (i,j). Moreover, the number of tour-operators is large enough so none of them knows how its decisions affect the aggregate production. Consequently, the external effect X_0^{ε} is taken as given. The solution of the n problems defined by (23) yields the package price:

$$q_0^{i,j} - \frac{r_0+1}{1-\tau}\frac{X_0^{\varepsilon}}{R} = \frac{q_0^{i,j}}{\sigma} \quad \rightarrow \quad q_0^{i,j} = q_0 = \frac{\sigma}{\sigma-1}\frac{r_0+1}{1-\tau}\frac{X_0^{\varepsilon}}{R}. \tag{24}$$

The equation (24) shows that a unique mark-up is charged. Using the package price in (24), the aggregate tourism production can be computed by proceeding as in the previous section:

$$X_0 = (mn)^{\frac{1}{1+\sigma\varepsilon}}\left(\frac{\sigma-1}{\sigma}\frac{1-\tau}{r_0+1}R\right)^{\frac{\sigma}{1+\sigma\varepsilon}}. \tag{25}$$

Once the package prices and productions have been determined, a number $m \times n$ of bilateral negotiations take place in the second step to split off the total surplus generated. More specifically, the tour-operator and the local firm negotiate on the local tourism price (transfer price) $q_{L,0}^{i,j}$ as to maximise the utility from the agreement, $V_0^{i,j}$:

$$\max_{q_{L,0}^{i,j}} V_0^{i,j} = \left(q_{L,0}^{i,j} - \frac{r_0+1}{1-\tau}X_0^{\varepsilon}\right)^{\varphi}\left(q_0^{i,j} - q_{L,0}^{i,j}\right)^{1-\varphi} x_0^{i,j}, \quad \varphi \in (0,1), \tag{26}$$

where the parameters φ and $1-\varphi$ represent the negotiation power of local and foreign firms, respectively. This maximisation problem is subject to the restrictions that the parties obtain at least the same profits as in the direct selling equilibrium. To this respect, when the direct selling is feasible the firms realise the government incentives

for implementing an optimal policy, so they consider as alternative profits those linked to the local optimum.

Under the assumption that the conditions for a general equilibrium with tour-operators are satisfied, the local tourism prices would become:

$$q_{L,0}^{i,j} = \left(1 + \frac{\varphi}{\sigma - 1}\right) \frac{r_0 + 1}{1 - \tau} \frac{X_0^{\varepsilon}}{R}, \tag{27}$$

and, consequently, the total surplus expressed in aggregate terms, Π_0^{TS}:

$$\Pi_0^{TS} \equiv \frac{\Pi_{L,0}}{1 - \tau} + \Pi_{F,0} = \frac{1}{\sigma - 1} \frac{r_0 + 1}{1 - \tau} \frac{X_0^{1+\varepsilon}}{R}, \tag{28}$$

would be share out between the local and the foreign firms according to their negotiation power, that is, $\Pi_{L,0} = \varphi(1 - \tau)\Pi_0^{TS}$ and $\Pi_{F,0} = (1 - \varphi)\Pi_0^{TS}$. This split off will remain unchanged in the case that we will analyse in the next section.

The aggregate equilibrium of the tourism economy

Using (2), (9) and (10), (25) and (27), we obtain the same equilibrium conditions as in the previous section, except for the relative price of consumption in period 0, $p_0 = \frac{\sigma - 1}{\sigma}(1 - \tau) R (mn)^{\frac{1}{\sigma}} X_0^{-\frac{1+\sigma\varepsilon}{\sigma}}$. These conditions allow the factor allocation and hence the tourism production to be obtained:

$$K_{X,0}^{STO} = \frac{\left(X_0^{STO}\right)^{1+\varepsilon}}{R} = \frac{\beta K_0}{\left(1 + \frac{\varphi}{\sigma - 1}\right) \frac{1}{1 - \tau} + \beta}, \tag{29}$$

where the superscript STO denotes the presence of several tour-operators. Considering the tourism production in (29), the local tourism price becomes equal to:

$$q_{L,0}^{STO} = \left(1 + \frac{\varphi}{\sigma - 1}\right) \frac{\sigma - 1}{\sigma} (mn)^{\frac{1}{\sigma}} \left(X_0^{STO}\right)^{-\frac{1}{\sigma}}. \quad (30)$$

Similarly to the case of direct selling, the equation (30) is the local residual tourism demand. This demand is above the marginal income of tourism packages whenever $\varphi \neq 0$, while in the direct selling situation it coincided with that marginal income. The reason for this result is quite obvious: the production of tourism packages is obtained by equalising the marginal income of tourism packages and the private marginal costs (average costs). Therefore, in order for the local firms to earn positive profits the local tourism price must forcedly be above the marginal income of tourism packages.

The local optimum

The solution of the planner's problem yields the optimal tax rate:

$$\tau^{STO} = 1 - \frac{\sigma - 1}{\sigma(1 + \varepsilon)} \left(1 + \frac{\varphi}{\sigma - 1}\right) \in (0,1). \quad (31)$$

The introduction of (31) into (29) shows that the optimal tourism production, $\tilde{X}_0^{STO}$, coincides with that in (20). As a consequence, if a direct selling situation was feasible and the firms took as alternative profits those associated to the local optimum, then no contract would be signed and the direct selling situation would prevail. Indeed, the comparison between the total surplus generated by the tour-operators and that in the alternative situation reveals that former is smaller than the later. Consistently, in the remaining of this section we will assume that the direct selling is unfeasible, so there are tour-operators in the economy.

The Figure 2, which displays the strategy for maximising profits at the aggregate level, illustrates the findings. With no policy the aggregate tourism production, X_0^{STO}, is obtained by equalising the marginal income of tourism packages (MITP) and the private

marginal costs or average costs (AC). The package price and the local tourism price, q_0^{STO} and $q_{L,0}^{STO}$, come from substituting that production in the demand of tourism packages (DTP) and the local residual tourism demand (LRTD), respectively. Provided that the problem of the commons remains, the agreements between the foreign and the local firms do not guarantee that the local tourism price is greater than or equal to the social marginal costs (SMC). To this respect, the figure depicts an example of the local tourism price being smaller than the social marginal costs. A public intervention is then needed with the aim of maximising social welfare. For achieving this objective, the local government considers the local residual tourism demand in (30) and maximise the social profits. Therefore, the optimal tourism production, $\tilde{X}_0^{STO}$, requires the equalisation of the marginal income of local tourism services (MILTS) and the social marginal costs (SMC).

FIGURE 2 ABOUT HERE

The existence of several tour-operators always leads to over-production of tourism services. The expression of the total mark-up implied by the local optimum seeds light on this result:

$$\tilde{q}_0^{STO} - p_0\left(1+\varepsilon\right)\frac{\left(\tilde{X}_0^{STO}\right)^{\varepsilon}}{R} = \underbrace{\frac{\tilde{q}_0^{STO}}{\sigma}}_{DTP-MITP} + \underbrace{\left(1-\varphi\right)\frac{\sigma-1}{\sigma}\frac{\tilde{q}_0^{STO}}{\sigma}}_{MITP-MILTS}. \tag{32}$$

The comparison between the mark-up in (24) (after setting $\tau = 0$ and $r_0 + 1 = p_0$) and that in (32) reveals that the sequential strategy of the government adds up a second mark-up, which is equal to the difference between the marginal income of tourism packages and that of local tourism services. This double margin operates raising the package price and reducing the tourism production. Moreover, to consider the social marginal costs instead of the private marginal costs operates in the same direction.

Accordingly, the implementation of the local optimum as a decentralised equilibrium requires taxing the local tourism price, which works increasing the private marginal costs (ACP).

A single tour-operator

Before carrying out the analysis, it should be noticed that the aggregate results from the direct selling situation with a unique foreign firm coincide with those in the third section.

The tour-operator' problem and the negotiation processes

In the first step of the process the tour-operator chooses a number $m \times n$ of package prices as to maximise the total profits:

$$\underset{\left\{q_0^{i,j}\right\}_{\substack{i=1,2,...,m;\\ j=1,2,...,n}}}{max} \sum_{i=1}^{m}\sum_{j=1}^{n}\left(\pi_{F,0}^{i,j}+\frac{\pi_{L,0}^{i,j}}{1-\tau}\right)=\sum_{i=1}^{m}\sum_{j=1}^{n}\left(q_0^{i,j}\right)^{1-\sigma}-\frac{r_0+1}{1-\tau}\frac{1}{R}\left(\sum_{i=1}^{m}\sum_{j=1}^{n}\left(q_0^{i,j}\right)^{-\sigma}\right)^{1+\varepsilon}, \quad (33)$$

where the external effect X_0^{ε} has been internalised. The solution of the problem yields the package price:

$$q_0^{i,j}-\frac{r_0+1}{1-\tau}\left(1+\varepsilon\right)\frac{X_0^{\varepsilon}}{R}=\frac{q_0^{i,j}}{\sigma} \quad \rightarrow \quad q_0^{i,j}=q_0=\frac{\sigma\left(1+\varepsilon\right)}{\sigma-1}\frac{r_0+1}{1-\tau}\frac{X_0^{\varepsilon}}{R}, \quad (34)$$

which incorporates a unique mark-up besides the social marginal costs. The aggregate tourism production can be then computed using the package price in (34):

$$X_0=\left(mn\right)^{\frac{1}{1+\sigma\varepsilon}}\left(\frac{\sigma-1}{\sigma\left(1+\varepsilon\right)}\frac{1-\tau}{r_0+1}R\right)^{\frac{\sigma}{1+\sigma\varepsilon}}. \quad (35)$$

In the second step, a number $m \times n$ of bilateral negotiations take place to split off the total surplus generated. More specifically, the tour-operator and each local firm negotiate on the local tourism price, $q_{L,0}^{i,j}$, as to maximise the utility from the agreement:

$$\max_{q_{L,0}^{i,j}} V_0^{i,j} = \left(q_{L,0}^{i,j} - \frac{r_0 + 1}{1-\tau} \frac{X_0^{\varepsilon}}{R} \right)^{\varphi} \left(q_0^{i,j} - q_{L,0}^{i,j} \right)^{1-\varphi} x_0^{i,j}, \tag{36}$$

subject to the restrictions that they obtain at least the same profits as in the direct selling optimum. Assuming that the conditions for a general equilibrium with a single tour-operator are satisfied, the local tourism prices can be written as:

$$q_{L,0}^{i,j} = \left(1 + \varphi \frac{1+\sigma\varepsilon}{\sigma - 1} \right) \frac{r_0 + 1}{1-\tau} \frac{X_0^{\varepsilon}}{R}, \tag{37}$$

and, consequently, the total surplus expressed in aggregate terms becomes:

$$\frac{\Pi_{L,0}}{1-\tau} + \Pi_{F,0} = \frac{1+\sigma\varepsilon}{\sigma - 1} \frac{r_0 + 1}{1-\tau} \frac{X_0^{1+\varepsilon}}{R}. \tag{38}$$

The aggregate equilibrium of the tourism economy

Some manipulations of (2), (9) and (10), (35) and (37) yield the same equilibrium conditions as in the previous section, except for $p_0 = \frac{\sigma - 1}{\sigma(1+\varepsilon)} (1-\tau) R (mn)^{\frac{1}{\sigma}} X_0^{-\frac{1+\sigma\varepsilon}{\sigma}}$.

From these conditions we obtain the capital allocation and the aggregate tourism production:

$$K_{X,0}^{TO} = \frac{\left(X_0^{TO} \right)^{1+\varepsilon}}{R} = \frac{\beta K_0}{\left(1 + \varphi \frac{1+\sigma\varepsilon}{\sigma - 1} \right) \frac{1}{1-\tau} + \beta}, \tag{39}$$

where the superscript TO indicates the presence of a unique tour operator. Considering the tourism production in (39), the local tourism price can be written as:

$$q_{L,0}^{TO} = \frac{1 + \varphi \frac{1+\sigma\varepsilon}{\sigma - 1}}{1+\varepsilon} \frac{\sigma - 1}{\sigma} (mn)^{\frac{1}{\sigma}} \left(X_0^{TO} \right)^{-\frac{1}{\sigma}}. \tag{40}$$

Provided that $\varphi \lessgtr \varepsilon(\sigma-1)/(1+\sigma\varepsilon)$, the local residual tourism demand in (40) can be located below or above the marginal income of tourism packages, or coincide with it. To this respect, it is worth noting that the aggregate tourism production is obtained by equalising the marginal income of tourism packages and the social marginal costs. Therefore, the local firms could earn positive profits even if the local tourism price was equal to or lower than the marginal income of tourism packages.

The local optimum

The solution of the planner's problem yields the optimal tax rate:

$$\tau^{TO} = 1 - \frac{\sigma-1}{\sigma(1+\varepsilon)}\left(1+\varphi\frac{1+\sigma\varepsilon}{\sigma-1}\right) \in (0,1). \tag{41}$$

Considering (41) and (39) it follows that the optimal tourism production, $\tilde{X}_0^{TO}$, is equal to that in (20). Accordingly, if a direct selling situation was feasible, then no contract would be signed. Indeed, for the total surplus to be greater than in the alternative situation it should hold that $\varepsilon > 1/(\sigma-2)$, which is in contradiction with the condition (22). Thus, in the remaining of this section we will assume that the direct selling is unfeasible, so there is a single tour-operator in the economy.

The Figure 3 illustrates the strategy for maximising profits at the aggregate level. With no policy the aggregate tourism production, X_0^{TO}, comes from equalising the marginal income of tourism packages (MITP) and the social marginal costs (SMC). Therefore, this arrangement leads to the maximum total surplus. The package price, q_0^{TO}, and the local tourism price, $q_{L,0}^{TO}$, are then obtained by substituting that production in the demand for tourism packages (DTP) and the local residual tourism demand (LRTD), respectively.

FIGURE 3 ABOUT HERE

Since there is a unique tour-operator that charges a unique mark-up and makes their decisions taking into account the social marginal costs, one might think that the problems of commons and anti-commons have been fixed. This argument would be correct from the tour-operator's point of view, since it yields the maximum total surplus. However, this is far from being true from the tourism economy's perspective. This arrangement does not guarantee that the local tourism price is equal to or greater than the social marginal costs. Even though this price was higher than the marginal costs, as in the Figure 3, the tourism economy would not be earning the maximum profits. Therefore, a public intervention would be justified in order to maximise the local welfare. For achieving this objective, the local government considers the local residual tourism demand and maximise the social profits. The optimal tourism production, $\tilde{X}_0^{TO}$, requires the equalisation of the marginal income of local tourism services (MILTS) and the social marginal costs (SMC). This result tells us that the existence of a single tour-operator always leads to tourism over-production. The comparison between the expressions for the total mark-up implied by the local optimum:

$$\tilde{q}_0^{TO} - p_0\left(1+\varepsilon\right)\frac{\left(\tilde{X}_0^{TO}\right)^{\varepsilon}}{R} = \underbrace{\frac{\tilde{q}_0^{TO}}{\sigma}}_{DTP-MITP} + \underbrace{\left(1-\varphi\right)\frac{1+\sigma\varepsilon}{1+\varepsilon}\frac{\sigma-1}{\sigma}\frac{\tilde{q}_0^{TO}}{\sigma}}_{MITP-MILTS}, \tag{42}$$

and that in (34) (after setting $\tau = 0$ and $r_0 + 1 = p_0$) indicates that the government adds up a second mark-up, which raises the package price and reduces the tourism production. Accordingly, the implementation of the local optimum as a decentralised equilibrium requires taxing the local tourism price, which increases both the average and the social marginal costs (ACP and SMCP, respectively). Under the policy, the

tour-operator equalises the social marginal costs associated to the policy (SMCP) and the marginal income of tourism packages (TPMI) to obtain the package production.

The Figure 4 shows our last result, which is referred to welfare changes provoked by the switch from several tour-operators to a single one. The figure depicts the frontiers of consumption possibilities, which are constructed using the equilibrium conditions $C_0 = K_0 - X_0^{1+\varepsilon}/R$ and $C_1 = q_{L,0}X_0$, and the social indifference curves associated to the local optimum, $C_0 = e^{\tilde{U}_0}C_1^{-\beta}$.

FIGURE 4 ABOUT HERE

One could think of the existence of a single tour-operator as being positive for welfare of the tourism economy, as long as it can internalise the external effect linked to congestion. The Figure 4 shows that this is not the case. On the contrary, no matter whether or not a public policy is implemented, the welfare level turns out to be lower with a single tour-operator than with several ones. The explanation can be found looking at the rewritten expressions of the local residual tourism demands in (30) and (40):

$$\begin{aligned} &\textit{Several tour-operators} \rightarrow \quad q_{L,0} = \underbrace{\frac{\sigma-1}{\sigma}(mn)^{\frac{1}{\sigma}}X_0^{-\frac{1}{\sigma}}}_{\textit{Average Cost}} + \underbrace{\frac{\varphi}{\sigma}(mn)^{\frac{1}{\sigma}}X_0^{-\frac{1}{\sigma}}}_{\textit{Total Surplus/Production}}, \\ &\textit{One tour-operator} \rightarrow \quad q_{L,0} = \underbrace{\frac{\sigma-1}{\sigma(1+\varepsilon)}(mn)^{\frac{1}{\sigma}}X_0^{-\frac{1}{\sigma}}}_{\textit{Average Cost}} + \underbrace{\varphi\frac{1+\sigma\varepsilon}{\sigma(1+\varepsilon)}(mn)^{\frac{1}{\sigma}}X_0^{-\frac{1}{\sigma}}}_{\textit{Total Surplus/Production}}. \end{aligned} \tag{43}$$

As long as $\varphi \in (0,1)$, the demand with a unique tour-operator lays below the one arising with several tour-operators. The transfer price is calculated as the sum of the average costs and the proportion φ of the total surplus per production unit. The switch from several tour-operators to a single one reduces the tourism production, which decreases the average cost and increases the total surplus per production unity. The former effect

turns out to be stronger than the latter one, so a reduction in the tourism price occurs.[7] As shown in the Figure 6, the reduction of the local residual tourism demand provokes a contraction of the consumption possibilities frontier:

$$\begin{aligned} &\textit{Several tour-operators} \rightarrow \quad C_0 = K_0 - \frac{1}{R}\left(\frac{\sigma}{\sigma - 1 + \varphi}(mn)^{-\frac{1}{\sigma}} C_1\right)^{\frac{\sigma(1+\varepsilon)}{\sigma-1}}, \\ &\textit{One tour-operator} \rightarrow \quad C_0 = K_0 - \frac{1}{R}\left(\frac{\sigma(1+\varepsilon)}{\sigma - 1 + (1+\sigma\varepsilon)\varphi}(mn)^{-\frac{1}{\sigma}} C_1\right)^{\frac{\sigma(1+\varepsilon)}{\sigma-1}}, \end{aligned} \tag{44}$$

which inevitably leads to a lessening in welfare. This striking result is due to the fact that the government can control the local tourism costs, but not the local residual tourism demand implied by the prevailing market structure.

Conclusion

It seems difficult to argue against the existence of the so-called commons and anti-commons problems in countries with the highest specialisation in tourism. The former and the latter problems lead to tourism over- and under-production, respectively. Their effects are not confined to the tourism sector, but they impinge on the resource allocation of the entire economy and hence on welfare. A public policy might be then necessary to maximise welfare of the local population. Consequently, the study of these impacts and policy implications requires a general equilibrium approach.

Since the foreign transport services and the local tourism goods are complementary, they can be combined as a package, and hence the direct selling and the presence of foreign tour-operators emerge as possibilities. In this respect, we have highlighted the underlying distributive problem generated by the complementariness and the type of arrangements in the tourism markets. We have shown that, regardless of

[7] It could be argued that there is no reason for thinking of the negotiation power of the parties as being the same in both cases. Though this seems a reasonable objection, it is also sensible to think of φ value as being smaller when a unique tour-operator exists, which would reinforce our results.

the type of arrangement, reaching the maximum welfare entails a price-leader strategy of the local government. We have obtained four main results. First, in the direct selling situation the optimal policy depends on the relative importance of the problems. Second, the presence of either one or several tour-operators does not solve the anti-commons problem provided it always leads to tourism over-production. Third, the existence of a unique tour-operator does not solve the congestion problem. Lastly, under sensible assumptions, the switch from several tour-operators to a single one turns to be welfare reducing.

A main conclusion emerges from our study. The tour-operators seek to maximise profits and not welfare of the tourism destination. Consequently, their view about the solution of the commons and anti-commons problems differs greatly from the tourism destinations'. Then, the government at the destination should not leave the solution of these problems in the tour-operators' hands. Despite the simplicity of our theoretical framework, this seems a quite general conclusion. Though we cannot discard the possibility that the discrepancy in objectives led to coincident outcomes, this would appear to be a particular, instead of general, case. Notwithstanding, we recognise that further research is needed for a better understanding of this subject. To this respect, aspects as the competition among different tourism destinations and the *tragedy of the commons* would certainly affect the tour-operators' strategy and the policy decisions.

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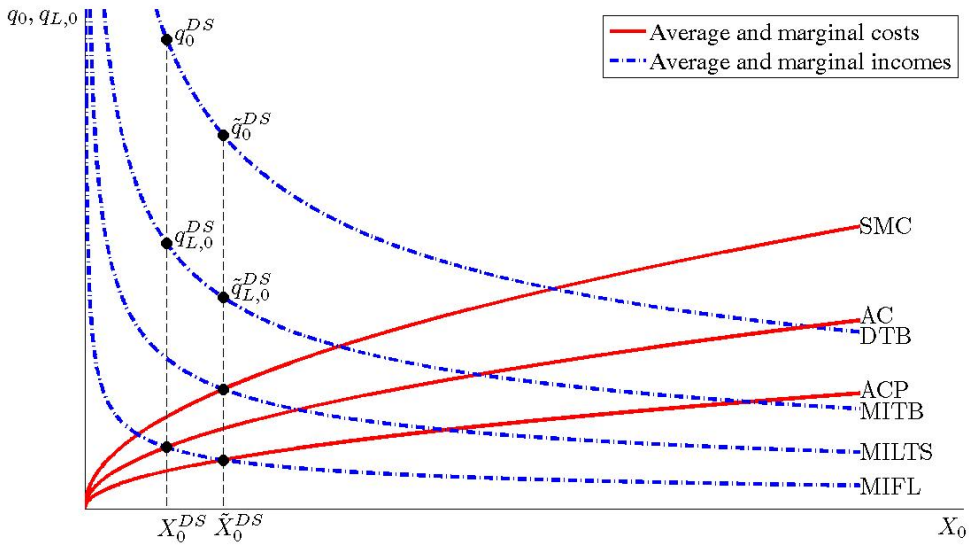
Figure 1: The profit-maximising strategy with direct selling: subsidy



Notes: The aggregate social costs considered by the local planner is $E_0 = p_0 X_0^{1+\varepsilon}$. The curves in the figure are defined as follows:

Social marginal most (SMC): $\dfrac{\partial E_0}{\partial X_0} = p_0 \left(1+\varepsilon\right) X_0^{\varepsilon}$

Average cost and private marginal cost (AC): $\dfrac{E_0}{X_0} = p_0 X_0^{\varepsilon}$

Average cost and private marginal cost under the policy (ACP): $\dfrac{E_0 / X_0}{1-\tau^{DS}} = \dfrac{p_0 X_0^{\varepsilon}}{1-\tau^{DS}}$

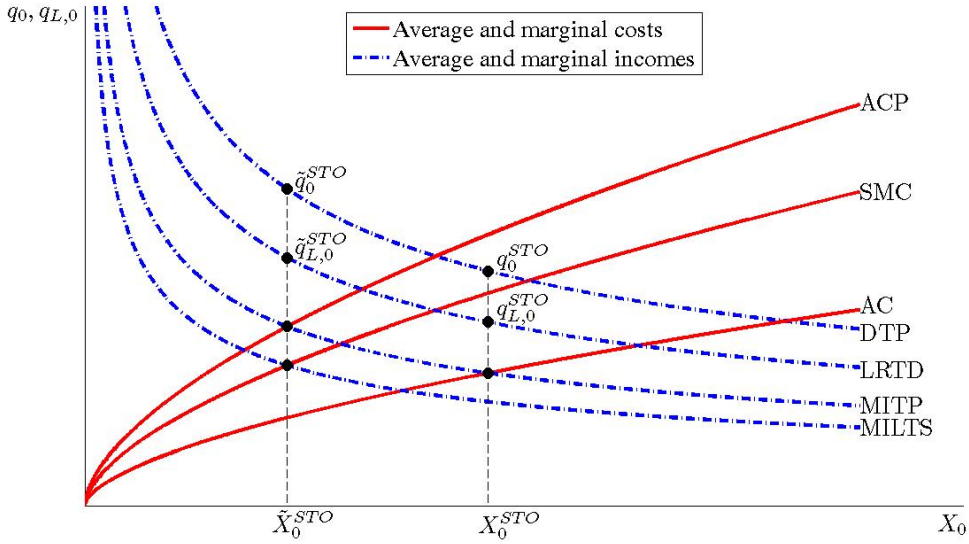
Demand of tourism baskets (DTB): $q_0 = \left(mn\right)^{\frac{1}{\sigma}} X_0^{-\frac{1}{\sigma}}$

Marginal income of tourism baskets (MITB): $\dfrac{\partial \left(q_0 X_0\right)}{\partial X_0} = q_{L,0} = \dfrac{\sigma-1}{\sigma}\left(mn\right)^{\frac{1}{\sigma}} X_0^{-\frac{1}{\sigma}}$

Marginal income of local tourism services (MILTS): $\dfrac{\partial \left(q_{L,0} X_0\right)}{\partial X_0} = \left(\dfrac{\sigma-1}{\sigma}\right)^2 \left(mn\right)^{\frac{1}{\sigma}} X_0^{-\frac{1}{\sigma}}$

Sum of local and foreign marginal incomes (MIFL): $\dfrac{\partial \left(q_{L,0} X_0\right)}{\partial X_0} + \dfrac{\partial \left(q_{F,0} X_0\right)}{\partial X_0} = \dfrac{\sigma-2}{\sigma}\left(mn\right)^{\frac{1}{\sigma}} X_0^{-\frac{1}{\sigma}}$

Figure 2: The profit-maximising strategy with several tour-operators



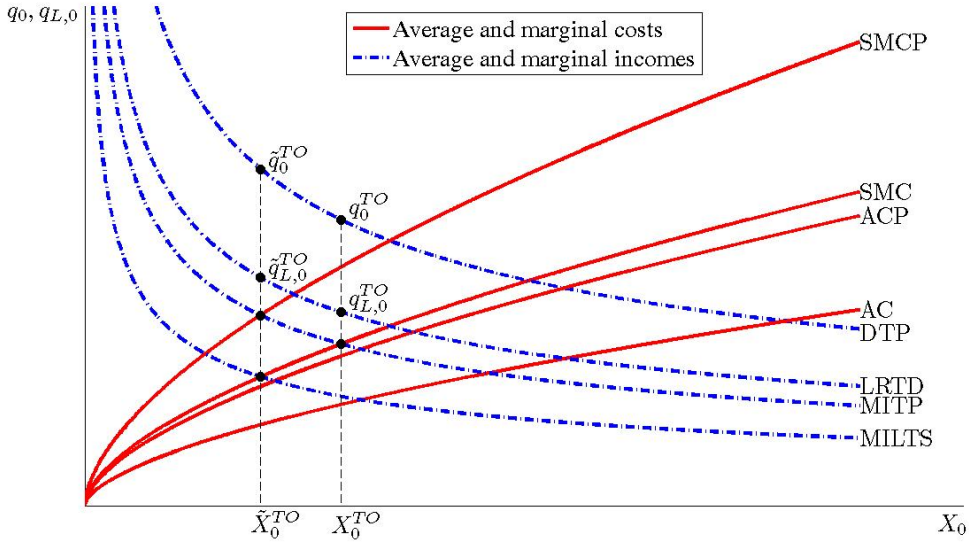
Notes: The curves are defined as in the Figure 1, except for:

Average cost and private marginal cost under the policy (ACP): $\dfrac{E_0/X_0}{1-\tau^{STO}} = \dfrac{p_0 X_0^{\varepsilon}}{1-\tau^{STO}}$

Residual local tourism demand (LRTD): $q_{L,0} = \left(1+\dfrac{\varphi}{\sigma-1}\right)\dfrac{\sigma-1}{\sigma}(mn)^{\frac{1}{\sigma}}\, X_0^{-\frac{1}{\sigma}}$

Marginal income of local tourism services (MILTS): $\dfrac{\partial\left(q_{L,0}X_0\right)}{\partial X_0} = \left(1+\dfrac{\varphi}{\sigma-1}\right)\left(\dfrac{\sigma-1}{\sigma}\right)^2 (mn)^{\frac{1}{\sigma}}\, X_0^{-\frac{1}{\sigma}}$

Figure 3: The profit-maximising strategy with a single tour-operator



Notes: The curves are the same as in the Figure 2, except for:

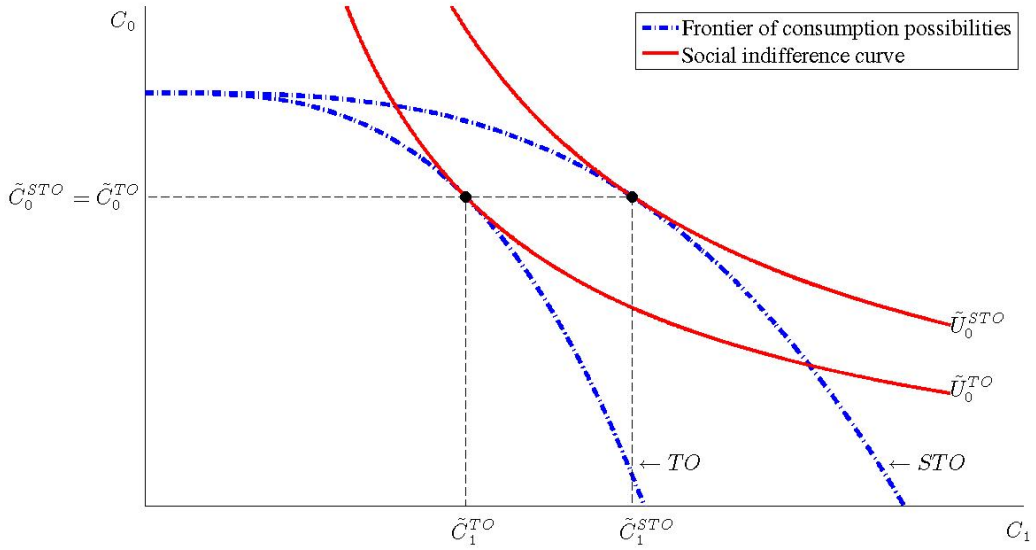
Marginal cost under the policy (SMCP): $\dfrac{\partial E_0 / \partial X_0}{1-\tau^{TO}} = \dfrac{p_0 \left(1+\varepsilon\right) X_0^{\varepsilon}}{1-\tau^{TO}}$

Average cost under the policy (ACP): $\dfrac{E_0 / X_0}{1-\tau^{TO}} = \dfrac{p_0 X_0^{\varepsilon}}{1-\tau^{TO}}$

Local residual tourism demand (LRTD): $q_{L,0} = \left(1+\varphi\dfrac{1+\sigma\varepsilon}{\sigma-1}\right)\dfrac{\sigma-1}{\sigma\left(1+\varepsilon\right)}\left(mn\right)^{\frac{1}{\sigma}} X_0^{-\frac{1}{\sigma}}$

Marginal income of local tourism services (MILTS): $\dfrac{\partial\left(q_{L,0} X_0\right)}{\partial X_0} = \left(1+\varphi\dfrac{1+\sigma\varepsilon}{\sigma-1}\right)\left(\dfrac{\sigma-1}{\sigma}\right)^2 \dfrac{\left(mn\right)^{\frac{1}{\sigma}}}{1+\varepsilon} X_0^{-\frac{1}{\sigma}}$

Figure 4: One tour-operator versus several tour-operators, and the welfare



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