Fondazione
Eni
Enrico Mattei

EE

THE ECONOMICS OF TOURISM AND SUSTAINABLE DEVELOPMENT

EDITED BY
ALESSANDRO LANZA, ANIL MARKANDYA, FRANCESCO PIGLIARU

THE FONDAZIONE ENI ENRICO MATTEI (FEEM) SERIES
ON ECONOMICS AND THE ENVIRONMENT

The Economics of Tourism and Sustainable Development

Edited by

Alessandro Lanza

Director, Fondazione Eni Enrico Mattei (FEEM), Milan, Italy

Anil Markandya

Fondazione Eni Enrico Mattei (FEEM), Milan, Italy and Professor of Economics, University of Bath, UK

Francesco Pigliaru

Professor of Economics, University of Cagliari and CRENoS, Italy

THE FONDAZIONE ENI ENRICO MATTEI (FEEM) SERIES ON ECONOMICS AND THE ENVIRONMENT

Edward Elgar

Cheltenham, UK • Northampton, MA, USA

Published by
Edward Elgar Publishing Limited
Glensanda House
Montpellier Parade
Cheltenham
Glos GL50 1UA
UK

Edward Elgar Publishing, Inc.
136 West Street
Suite 202
Northampton
Massachusetts 01060
USA

A catalogue record for this book
is available from the British Library

ISBN 1 84542 401 8

Printed and bound in Great Britain by MPG Books Ltd, Bodmin, Cornwall

Contents

3. Land, environmental externalities and tourism development*

Javier Rey-Maquieira Palmer, Javier Lozano Ibáñez and Carlos Mario Gómez Gómez

1. INTRODUCTION

Nowadays there is wide consensus that there are limits to a tourism development based on quantitative growth. Obviously, the availability of a fixed amount of land in a tourism resort puts an ultimate limit on its carrying capacity. However, it is reasonable to assume that before the full occupation of land by tourism facilities other limiting factors will operate. Thus the continuous growth in the number of tourists and the associated urban development, especially in small tourism destinations, can give rise to costs in the form of congestion of public goods and loss of cultural, natural and environmental resources. These costs are not only borne by the residents but may also negatively affect the tourism attractiveness of the destination, the willingness to pay for tourism services provided in the tourism resort and thus a fall in the returns to investment in the tourism sector.

In this chapter we develop a two-sector dynamic general equilibrium model of a small open economy where tourism development is characterized as a process of reallocation of land in fixed supply from low productivity activities (agriculture, forestry and so on) to its use in the building of tourism facilities. This change in the use of land goes along with investment aimed at the building of accommodation and recreational facilities. Land in the traditional sector, besides being a direct production factor in this sector, contains the cultural, natural and environmental resources of the economy. These resources are not only valued by the residents but also have a positive effect on the tourism attractiveness of the resort and on the willingness to pay to visit the tourism destination. We therefore make explicit one of the characteristics of tourism development, i.e. the urbanization of land. The model allows for discussion about the limits of the quantitative tourism development in terms of three relevant factors: dependence of tourism with respect to cultural, natural and environmental assets available in fixed supply, the positive valuation of these assets by the residents and relative productivity of tourism with respect to other alternative sectors.

Despite the costs of tourism expansion, in the model tourism development is associated with improvements in the standard of living for the residents that are ultimately determined by two factors: sectoral change and investment opportunities associated with the tourism sector on the one hand and improvements in the price of tourism relative to manufactures on the other hand. While the latter has already been put forward by Lanza and Pigliaru (1994), this is to our knowledge the first chapter to consider in a dynamic general equilibrium setting the reallocation of factors from low productivity sectors to the tourism sector as a possible explanation for the fast growth of the economies that specialize in tourism.

The rest of the chapter is organized as follows. Section 2 discusses the model. Section 3 shows the optimal solution. In section 4 we obtain the behavior of the economy when the costs of tourism development are external to the decision makers. Section 5 compares the optimal and decentralized solution with the green golden rule in order to discuss several issues regarding long-term environmental degradation. Section 6 considers the case when the price of tourism relative to manufactures grows exogenously, driven by international factors, and compares the dynamics of land allocation in the optimal and decentralized solution. Finally, section 7 concludes.

2. THE MODEL

2.1 Production

We consider a region with a limited space that we normalize to one. Land has two alternative productive uses. On the one hand, it can be used in a traditional sector (agriculture, farming, forestry). On the other hand, it can be combined with physical capital to obtain tourism facilities for accommodation and recreational purposes. We denote the first type of land L_T and the second L_{NT}.

In the economy there are three sectors. First, production in the traditional sector depends on land devoted to this purpose, with decreasing returns and the following production function:

$$Y_{NT} = g(L_{NT})$$

or, given that L_T is the complementary of L_{NT}:

$$Y_{NT} = f(L_T), \tag{3.1}$$

where $f(L_T)$ and df/dL_T are continuous functions in the interval $L_T \in [0,1]$ with the following properties:

$$Y_{NT}=0 \quad \text{when} \quad L_T=1$$

$$\frac{dY_{NT}}{dL_{NT}}>0, \frac{d^2Y_{NT}}{dL_{NT}^2}<0, \quad \lim_{L_{NT}\to 0^+}\frac{dY_{NT}}{dL_{NT}}=\infty$$

$$\frac{dY_{NT}}{dL_T}<0, \frac{d^2Y_{NT}}{dL_T^2}<0, \quad \lim_{L_T\to 1^-}\frac{dY_{NT}}{dL_T}=-\infty$$

Second, a construction sector builds tourism facilities for accommodation and recreational purposes using land and investment in physical capital. For simplicity, we consider that both production factors are combined in fixed proportions to obtain units of accommodation capacity according to the following expression:

$$\dot{T}=\min(\eta\dot{L}_T, \varphi I), \tag{3.2}$$

where $\dot{T}$ are new units of accommodation capacity that are built in each moment of time. $\dot{L}_T$ and I are the amount of land and investment needed for providing the tourism facilities associated with those units of accommodation capacity, while η and φ are fixed parameters.

Given (3.2), efficiency requires that:

$$\dot{T}=\eta\dot{L}_T=\varphi I$$

and therefore:

$$\dot{L}_T=\frac{\varphi}{\eta}I \tag{3.3}$$

$$T(\tau)=\int_0^\tau \dot{T}(t)dt=\int_0^\tau \eta\dot{L}_T(t)dt=\eta L_T(\tau), \tag{3.4}$$

where in (3.4) we have assumed that $T(t=0)=L_T(t=0)=0$.

Expression (3.3) shows the relationship between investment and land in the provision of tourism facilities, where η/φ measures the investment per unit of land. According to expression (3.4), accommodation capacity is proportional to the land devoted to tourism facilities.

Finally, a tourism sector supplies accommodation and recreational services using tourism facilities. Output of the tourism sector is measured by the number of night stays per unit of time. Assuming that night stays is a fixed multiple ϑ of the accommodation capacity, output of the tourism sector is a linear function of the land occupied by tourism facilities:

$$Y_T = AL_T, \; A = \vartheta\eta. \tag{3.5}$$

Notice that A is the upper limit to the output of the tourism sector, that is, if $L_T = 1$, then $Y_T = A$. Therefore, this parameter can be interpreted as a measure of physical carrying capacity. The number of the night stays is a fraction of this carrying capacity determined by the fraction of the space devoted to tourism facilities.

2.2 Trade Flows

We are interested in a situation where tourism services are provided to foreigners. We assume that the economy sells the whole production of both sectors in exchange for an homogeneous good, manufactures, that is produced abroad. This imported good is used for consumption and investment and it is the numeraire. Moreover, for simplicity we assume that the economy cannot lend or borrow from abroad. Given these assumptions, the goods market clearing condition implies:

$$\begin{gathered} TR + NTR = C + I \\ TR = P_T Y_T \\ NTR = P_{NT} Y_{NT}, \end{gathered} \tag{3.6}$$

where TR and NTR stand for tourism and non-tourism revenues and P_T and P_{NT} are the prices of tourism and non-tourism production relative to manufactures, while C is aggregate consumption.

2.3 Hypothesis about Prices of Final Goods and Tourism Revenues Function

We assume that P_{NT} is fixed, that is the economy is small in the international market of this product. Without loss of generality we normalize this price to one.

Regarding the price of the tourism services, our crucial assumption is that the price of the night stay depends on the satisfaction of the tourists that visit the resort. The satisfaction of a visitor depends on many variables: some are specific to the tourism firm that provides for lodging and recreational services and some are common to the whole tourism resort. The model includes two of the first kind of characteristics that could be determinants of the satisfaction of visitors, namely capital and land per unit of accommodation capacity. However, these ratios are considered exogenous and therefore play a secondary role in the model. Our interest lies in those characteristics that are common to the tourism resort and, specifically, in landscape and cultural and environmental assets. Regarding this, we assume two hypotheses: first, loss of landscape and cultural and environmental assets reduces the satisfaction of the tourists that visit the resort; and second, these intangibles can be approximated by the allocation of land between its alternative uses. Basically we are assuming that the economy is endowed with natural and cultural assets with tourism attractiveness and these assets are intrinsically linked with that fraction of land devoted to traditional activities. With this assumption we follow works by Rubio and Goetz (1998) and Pisa (2003) where the undeveloped fraction of land is used as a proxy for environmental quality.

Formally our reasoning runs as follows. We define a utility function that measures the satisfaction per night stay of a tourist that visits the resort:

$$U_T^i = U_T^i(\omega^i, \Omega),$$

where U_T^i is satisfaction of a tourist that receives services from firm i, ω^i is a vector of those characteristics specific to that tourism firm and Ω measures characteristics that are common to the whole tourism resort (landscape, cultural and environmental assets, congestion). Given the restrictions imposed to the production sector, all the tourism firms are identical and therefore we can drop the index i. Let us now define P_U as the price a tourist is willing to pay for a unit of satisfaction obtained in the resort. We consider that this price is exogenously determined in the international market and it is a price relative to manufactures. Given this, we can obtain an expression for the price for tourism services in the resort:

$$P_T = P_U U_T(\omega, \Omega),$$

where P_T is the price paid per night stay. This function could be interpreted in the following way. In the international economy there is a continuum of tourism markets differentiated by their quality and the price paid for the tourism services. In each of them the suppliers are price-takers but they can move along the quality ladder either due to their own decisions or due to changes in the characteristics of the tourism resort where they are located. If we consider that the allocation of land is a good approximation of Ω, then:

$$P_T = P(L_{NT}),\ P'(L_{NT}) > 0$$

or, alternatively,[1]

$$P_T = P(L_T),\ P'(L_T) < 0,$$

where we have dropped the vector ω since it is constant through time and we have normalized P_U to one.

In the literature we can find several works that justify the hypothesis that the tourism price depends on the allocation of land. First, applying the contingent valuation methodology, works such as Drake (1992), Pruckner (1995) or Drake (1999) show that the willingness to pay for the landscape associated with agricultural land can be large. On this base, López et al. (1994) and Brunstad et al. (1999) consider the hypothesis that this willingness to pay is a function of the amount of land devoted to agricultural activities. Second, in the tourism field Fleischer and Tsur (2000), applying the travel cost method, show that tourists give a positive valuation to agricultural landscape that is of a large magnitude in comparison with the agricultural production value. Huybers and Bennett (2000) also measure the willingness to pay of tourists for better environmental conditions and lower congestion in the tourism resorts they visit.

Given (3.5) and the function for the price of a night stay, tourism revenues are:

$$TR = AL_T P(L_T).$$

We consider that this function is continuous and twice differentiable in the interval $L_T \in [0,1]$.

The occupation of the land by tourism facilities has two opposite effects on tourism revenues: on the one hand, a positive quantity effect given the positive relationship between night stays and land occupied by tourism facilities and, on the other hand, a negative effect on price due to the loss of intangible assets with tourism attractiveness. The relative strength of both effects determines the behavior of tourism revenues along a process of tourism development. Regarding this, we can consider two interesting scenarios.

In the first, the quantity effect dominates the price effect, that is:

$$\frac{dTR}{dL_T} > 0 \ \forall L_T \in [0,1]$$

This is the case if the elasticity of the price with respect to L_T is below one $\forall L_T \in [0,1]$

In a second interesting scenario the elasticity of the tourism price is increasing with L_T in such a way that:

$$\frac{dTR}{dL_T} > 0 \quad \text{if } L_T \in [0, \hat{L}_T)$$
$$\frac{dTR}{dL_T} < 0 \quad \text{if } L_T \in (\hat{L}_T, 1]$$
$$\hat{L}_T \in (0,1),$$

where $\hat{L}_T$ is a tourism development threshold beyond which tourism expansion leads to a fall in tourism revenues. This will be the case if the elasticity of the price is lower than one when L_T is below that threshold and higher than one when L_T is above it.[2]

In both scenarios we consider that:

$$\frac{d^2TR}{dL_T^2}<0$$

$$TR(L_T)>0 \ \forall L_T \in (0,1].$$

The second condition implies that the intangible assets linked to land used in traditional activities are not essential for the resort to have tourism attractiveness since the tourism price is positive even in the case where all the land is occupied by tourism facilities.

2.4 Residents' Preferences

We consider that the economy is populated by a single representative agent that gives positive value to consumption and those cultural and natural assets that are contained in land devoted to traditional activities. His/her instantaneous utility function is:

$$U=U(C,L_{NT}) \quad U_C>0,\ U_{CC}<0,\ U_{LNT}>0,\ U_{LNTLNT}<0$$

3. THE OPTIMAL SOLUTION

The optimal solution results from solving the following problem:

$$\text{MAX}\int_0^{\infty} e^{-\rho t}U(C, L_{NT})dt$$

subject to:

$$\dot{L}_T=\frac{\varphi}{\eta}[TR(L_T)+NTR(L_T)-C] \qquad (3.7)$$

$$C\geq 0$$

$$0\leq L_T\leq 1$$

$$L_{NT}=1-L_T,$$

where (3.3) and (3.6) have been considered and ρ is the rate of time preference.

The first-order conditions of the maximum principle are:

$$U_C = \lambda \frac{\varphi}{\eta} \tag{3.8}$$

$$-U_{L_{NT}} + \lambda \frac{\varphi}{\eta}[TR'(L_T) + NTR'(L_T)] = \rho\lambda - \dot{\lambda} \tag{3.9}$$

and the transversality condition is:

$$\lim_{t \to \infty} e^{-\rho t}\lambda(t)L_T(t) = 0.$$

From (3.8) and (3.9) results:

$$TR'(L_T) = \frac{\eta}{\varphi}\left[\rho + \theta\frac{\dot{C}}{C} + \frac{U_{CL_{NT}}}{U_C}\dot{L}_T\right] - NTR'(L_T) + \frac{U_{L_{NT}}}{U_C}, \tag{3.10}$$

where $\theta = -U_{CC}C/U_C$ is the elasticity of the marginal utility of consumption which is assumed constant.

Expression (3.10) is the Keynes–Ramsey rule that equates marginal returns to L_T (left-hand side) and the loss in utility and revenues from the traditional sector that arises from a marginal development of land aimed to accommodate tourism facilities (right-hand side). In equilibrium, marginal returns to L_T have to be larger the larger is the rate of time preference, since the occupation of land by tourism facilities requires an investment effort and therefore a delay in consumption. The second and third terms on the right-hand side measure the proportional change of the marginal utility of consumption, $-\dot{U}_C/U_C$. If, for instance, marginal utility of consumption falls through time,[3] the faster its fall, the lower the value of an increase in consumption capacity due to the expansion of tourism and, therefore, the higher the marginal return of L_T should be. The fourth term is the loss of revenues from the traditional sector due to a marginal transfer of land from that sector to the tourism sector. Finally, tourism expansion results in environmental, landscape and cultural losses whose value in terms of consumption is U_{LNT}/U_C, that is, the last term of the right-hand side.

In the steady state all the variables remain constant. Therefore, and given (3.7) and (3.10) in the steady state the following conditions must be satisfied:

$$C_I = \frac{1}{\nu\theta}\left\{(1 - L_T)\left[TR'(L_T) + NTR'(L_T) - \frac{\eta}{\varphi}\rho\right] - \nu(1-\theta)[TR(L_T) + NTR(L_T)]\right\} \tag{3.11}$$

$$C_{II} = TR(L_T) + NTR(L_T) \qquad (3.12)$$
$$C_I = C_{II},$$

where we have considered the following utility function for the resident:

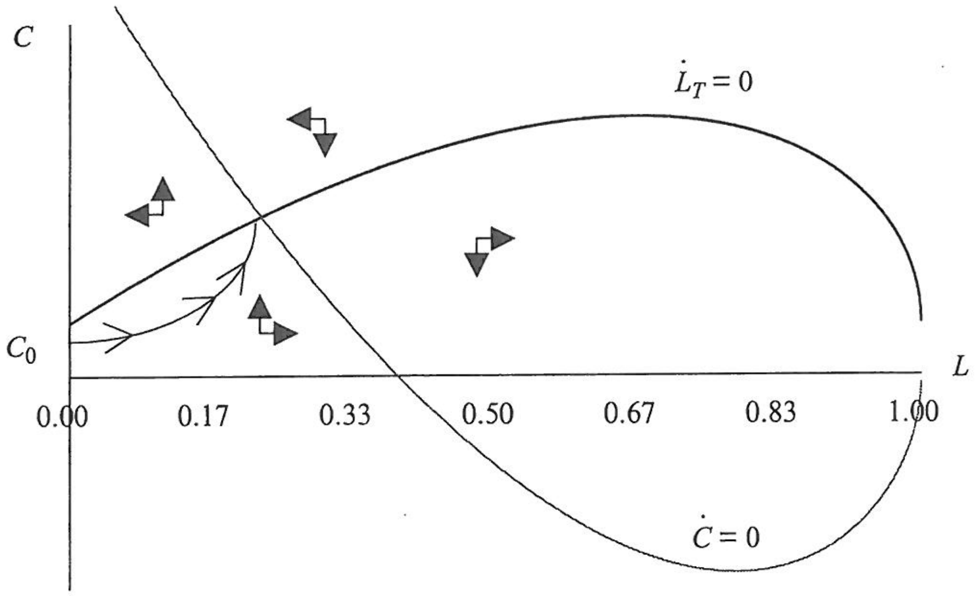
$$U = \frac{(CL_{NT}^{\nu})^{1-\theta}}{1-\theta} \qquad (3.13)$$

Proposition 1. *In the optimal solution there is a unique steady state where the tourism sector is present if and only if the following condition is satisfied:*

$$TR'(0) > \nu NTR(0) - NTR'(0) + \frac{\eta}{\varphi}\rho. \qquad (3.14)$$

If (3.14) is satisfied, in the steady state $C > 0$ *and* $L_T \in (0,1)$*.*
Proof: see Appendix I.

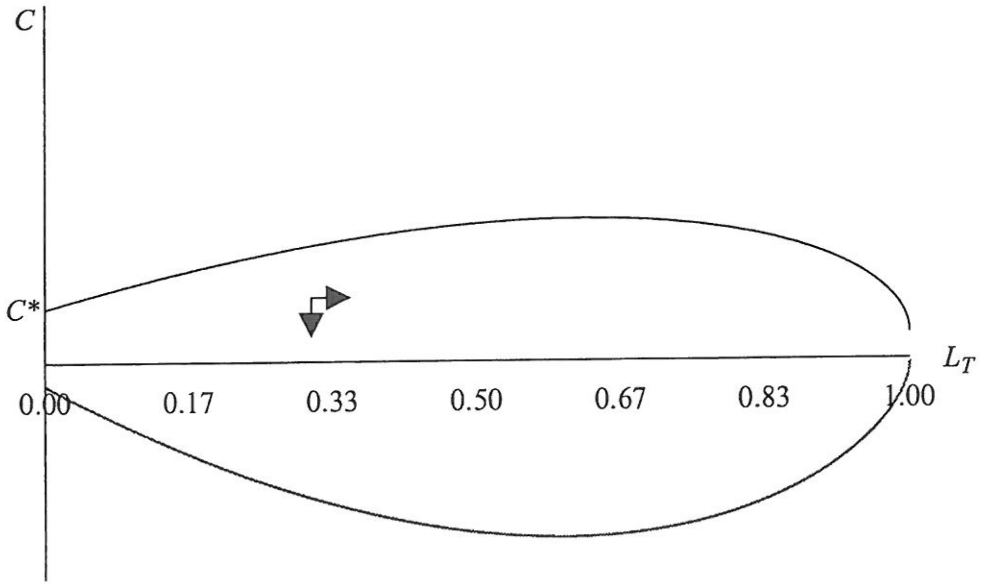
Let us assume that the economy is initially specialized in the traditional sector and condition (3.14) is satisfied. As is shown in Figure 3.1, there is an initial consumption level, C_0, that puts the economy on a path that



Note: [a] The following functional forms and parameter values have been used: $Y_{NT} = B(L_{NT})^{\beta}$, $P_T = P_U[(L_{NT})^{\alpha} + j]$, $IT = AL_T P_T$, $B = 300\,000$, $A = 3\,000\,000$, $\alpha = 0.5$, $\beta = 0.9$, $\eta = 100\,000$, $\varphi = 0.035$, $\theta = 0.8$, $\rho = 0.05$, $\nu = 0.5$, $j = 0.1$, $P_U = 1$.

Figure 3.1 Steady state and path of tourism development in the optimal solution[a] converges to the steady state.[4] This path is characterized by a process of tourism development where capital accumulates, land is progressively occupied by tourism facilities and consumption and tourism revenues grow. This process of tourism expansion stops before reaching the physical carrying capacity due to three factors: the negative effect of congestion, loss of intangible assets on residents' and tourists' utility and the increase in marginal returns to land in the traditional sector.

Expression (3.14) can be interpreted as a necessary condition for a process of tourism development to be socially optimal. That is, for residents to be interested in the expansion of the tourism sector, revenues from the initial development of this sector, net of the revenue losses in the traditional sector, that is, $TR'(0) + NTR'(0)$, should be high enough; total revenues from the traditional sector when the economy is fully specialized in this sector, that is, $NTR(0)$, should be low enough; moreover, the weight on residents' utility of the intangible assets that are linked to land used in the traditional sector, ν, as well as the rate of time preference, ρ, and investment per unit of land required for the building of tourism facilities, η/φ, should be low enough. Figure 3.2 shows a case when condition (3.14) is not satisfied. Regarding initial consumption, $C(t=0) > C^*$ is not possible, since it implies $\dot{L}_T(t=0) < 0$ and therefore a negative value of L_T. Any value of



Note: [a] Same functional forms and parameter values as in Figure 3.1 except for P_U. Here $P_U = 0.5$.

Figure 3.2 A case where the expansion of the tourism sector is not socially optimal[a]

$C(t=0) < C^*$ would set the economy in a path where $C(t) < C^*\ \forall t$, which is inferior to an alternative feasible path where $C(t) = C^*\ \forall t$. Therefore, the optimal solution is $C(t) = C^*$, $L_T(t) = 0\ \forall t$, that is, society is not interested in the tourism development.

4. SOLUTION WITH EXTERNALITIES

In a decentralized economy some of the costs associated with tourism expansion are not considered in the decisions about allocation of factors. For instance, lack of well-defined property rights on natural, environmental and landscape assets implies that, without public intervention, the tourism sector does not compensate the residents for the degradation of those assets linked to tourism expansion. Some of the costs of the tourism development fall on the tourism sector in the form of lower tourism attractiveness of the resort and a lower tourism price. However, the tourism price depends on the characteristics of the whole tourism resort regarding congestion and quality and abundance of intangible assets and, therefore, except for the case of perfect coordination in the tourism sector (for instance, in the case of a monopoly), the decisions of any of the tourism firms will cause negative externalities to the rest of the sector.

In this section the behavior of the model is explored in a case where the costs associated with tourism expansion are purely external. That is, the agents that take the decisions about the allocation of factors do not take into account the negative effects of congestion and the loss of intangible assets either on the residents (externalities on residents) or on the tourism price (intrasector externalities).

Applying the maximum principle to this version of the model, we obtain:

$$U_C = \lambda \frac{\varphi}{\eta} \tag{3.15}$$

$$\lambda \frac{\varphi}{\eta}[AP(L_T) + NTR'(L_T)] = \rho\lambda - \dot{\lambda} \tag{3.16}$$

and the transversality condition is:

$$\lim_{t \to \infty} e^{-\rho t}\lambda(t)L_T(t) = 0.$$

Condition (3.16) is different from (3.9) since in the former we assume that the effects of a change in the use of land on residents' utility and on the price of a night stay are not considered in the decisions of allocation of factors.

The behavior of the economy is determined by the transversality condition and the following dynamic system:

$$\frac{\dot{C}}{C}=\frac{1}{\theta}\frac{\varphi}{\eta}\left[AP(L_T)+NTR'(L_T)-\nu(1-\theta)\frac{1}{1-L_T}[TR(L_T)\right.$$
$$\left.+NTR(L_T)-C]-\frac{\eta}{\varphi}\rho\right] \tag{3.17}$$

$$\dot{L}_T=\frac{\varphi}{\eta}[TR(L_T)+NTR(L_T)-C], \tag{3.7}$$

where (3.13), (3.15) and (3.16) have been considered. The steady state satisfies the following conditions:

$$C_I=-\frac{(1-L_T)}{\nu(1-\theta)}\left[AP(L_T)+NTR'(L_T)-\frac{\eta}{\varphi}\rho\right]+TR(L_T)+NTR(L_T) \tag{3.18}$$

$$C_{II}=TR(L_T)+NTR(L_T) \tag{3.19}$$
$$C_I=C_{II}.$$

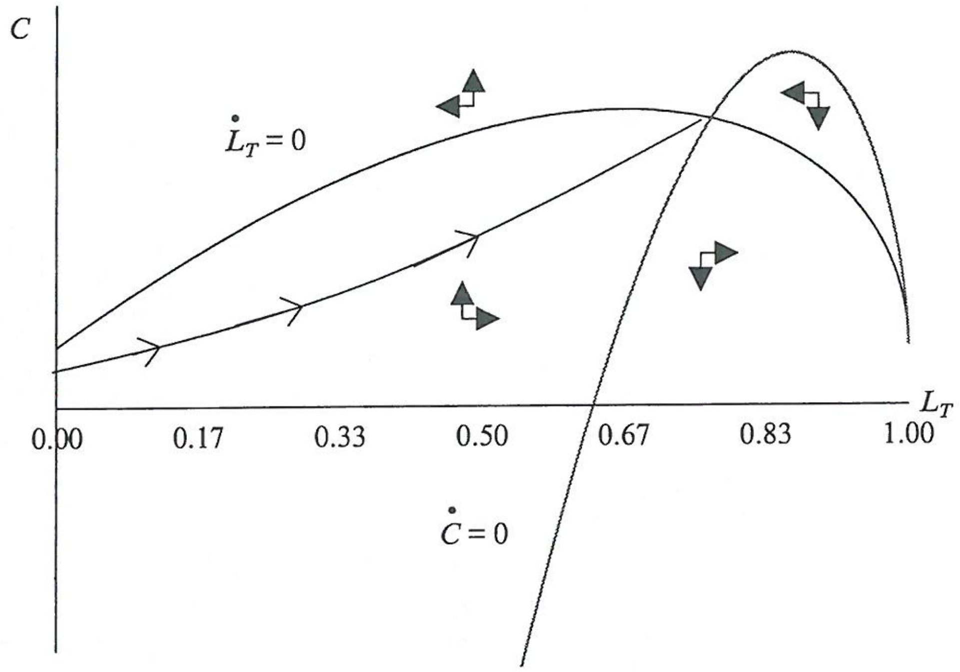
Proposition 2. *In the solution with externalities there is a unique interior steady state if and only if the following condition is satisfied:*

$$AP(0)+NTR'(0)-\frac{\eta}{\varphi}\rho>0. \tag{3.20}$$

If (3.20) is satisfied, in the interior steady state $C>0$, $L_T\in(0,1)$.
Proof: see Appendix II.

As is shown in Appendix II, the interior steady state is saddle-path stable and satisfies the transversality condition. Depending on the functional form of the tourism revenues function, there could exist a second steady state where $L_T=1$. However, this steady state does not satisfy the transversality condition.

In the optimal solution, if the economy is initially specialized in traditional activities and condition (3.20) is satisfied, the economy will follow a path of tourism expansion characterized by the progressive occupation of land by tourism facilities, accumulation of capital and growth in consumption and tourism revenues. The condition that ensures that this process of tourism development stops before the whole land is occupied by tourism facilities is the assumption that marginal returns to land in the



Note: [a] Same functional forms and parameter values as in Figure 3.1.

Figure 3.3 Steady state and path of tourism development in the solution with externalities[a]

traditional sector go to infinity when L_{NT} tends to zero. Figure 3.3 shows the steady state and the transitional path for the solution with externalities.

It is easy to show that in the solution with externalities tourism expansion is excessive from the social point of view. On the one hand, in the solution with externalities land occupied by tourism facilities when the steady state is reached can be worked out from the following expression:

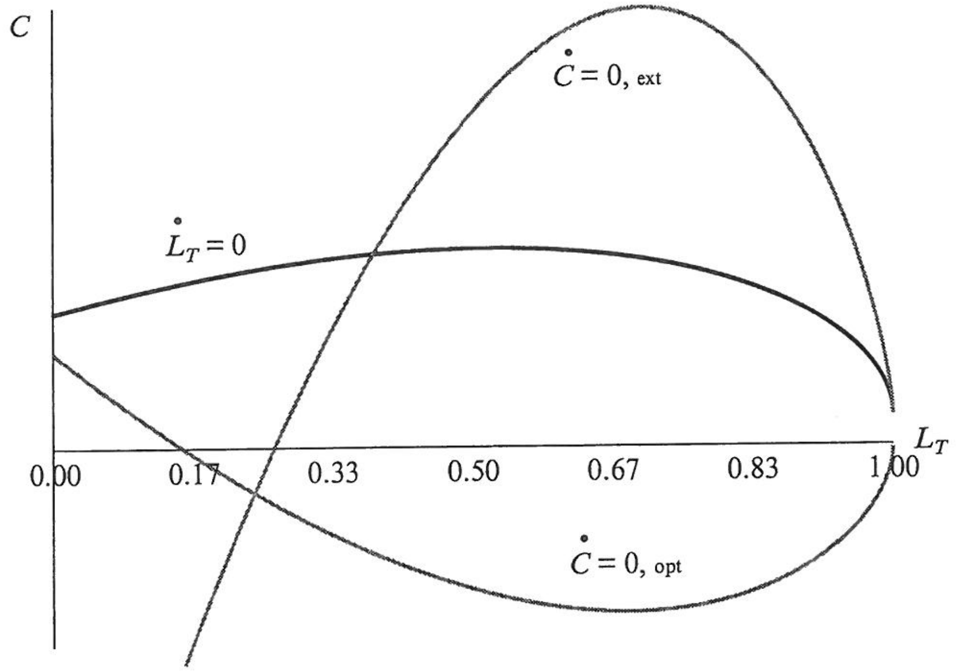
$$AP(L_T) + NTR'(L_T) = \frac{\eta}{\varphi}\rho, \tag{3.21}$$

where (3.18) and (3.19) have been considered.

On the other hand, from (3.11) and (3.12) it follows that in the optimal solution:

$$AP(L_T) + NTR'(L_T) = \frac{\nu}{1 - L_T}[TR(L_T) + NTR(L_T)] - AL_T P'(L_T) + \frac{\eta}{\varphi}\rho$$

Given that $(\nu/(1 - L_T))[TR(L_T) + NTR(L_T)] - AL_T P'(L_T) > 0 \ \forall L_T \in (0,1)$ and that the left-hand side of both expressions is decreasing with L_T, it follows that when the economic system does not consider the negative



Note: [a]Same functional forms and parameter values as in Figure 3.1 except for the productivity parameter of the traditional sector.

Figure 3.4 A case where tourism expansion takes place despite being suboptimal[a]

external effects of the tourism sector the proportion of land occupied by tourism facilities as well as the accommodation capacity of the tourism resort are excessive from the social welfare point of view.

What is more, when the costs of the tourism expansion are not internalized, it could happen that a process of tourism development would take place despite this being socially suboptimal. This is what happens in the model when (3.20) is satisfied but (3.14) is not. Figure 3.4 shows a case of this sort.

5. ENVIRONMENTAL DEGRADATION, DISCOUNTING AND EXTERNALITIES

Environmental degradation has often been explained by intergenerational conflict. That is, present generations, seeking to improve their own welfare and disregarding the welfare of future generations, overexploit natural resources leaving a bequest of degraded environment and low welfare. According to this explanation, a high discount factor is to blame for unsustainable development paths.

We address this question in the context of our model. We show that a higher discount factor implies higher (not lower) cultural, natural and environmental assets in the long run. This is not to say that the economy cannot end up with an excessive degradation of these assets but this will be due to the presence of externalities in the process of tourism development.

To show this, let us first calculate the 'green' golden rule level. In the context of this model, the green golden rule level is the allocation of land that maximizes utility in the long run (steady state). In the words of Heal (1998), this is the maximum level of sustainable welfare and it could be interpreted as the long-run situation of an economy that would only care for long-term welfare. The green golden rule comes from the following problem:

$$\underset{C, L_T}{\text{MAX}}\ U = \frac{[C(1 - L_T)^{\nu}]^{1-\theta}}{1-\theta}$$

subject to

$$C = TR(L_T) + NTR(L_T),$$

which gives the following condition:

$$\Phi(L_T) = \frac{(1 - L_T)}{\nu}[TR'(L_T) + NTR'(L_T)] - [TR(L_T) + NTR(L_T)] = 0. \tag{3.22}$$

The optimal solution and the green golden rule only differ in that in the former the welfare during the transition to the steady state is also considered in the economic decisions and, moreover, the future is discounted. In the optimal solution the economy ends up with a lower level of L_T than the green golden rule level. This can be shown if we combine (3.11) and (3.12) to get:

$$\begin{aligned}\Phi(L_T) &= \frac{(1 - L_T)}{\nu}[TR'(L_T) + NTR'(L_T)] - [TR(L_T) + NTR(L_T)] \\ &= \frac{(1 - L_T)}{\nu}\frac{\eta}{\varphi}\rho.\end{aligned} \tag{3.23}$$

Given that the right-hand side of (3.23) is positive when it is evaluated at the steady state of the optimal solution and that $\Phi'(L_T) < 0$ for the relevant range of values for L_T, we can conclude that in the optimal solution the economy ends up with a level of L_T that is lower than the green golden rule. That is, in this model it is not true that environmental degradation is a consequence of disregarding future generations' welfare since if society

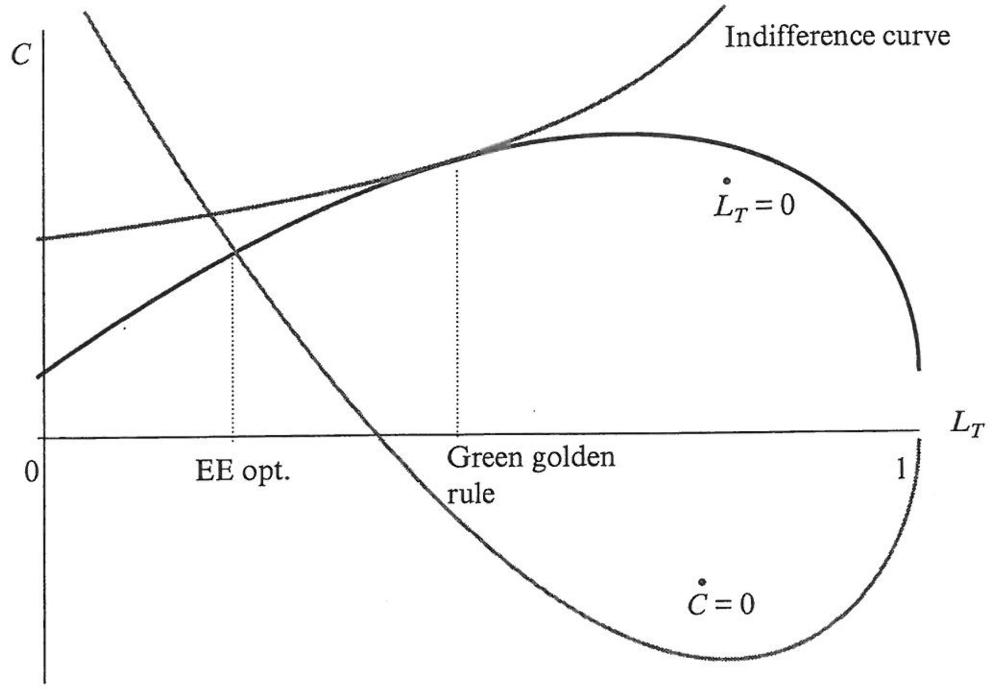


Figure 3.5 Optimal solution's steady state and green golden rule

were only worried about long-term welfare it would opt for a larger tourism expansion and lower long-term cultural, natural and environmental assets. This is due to the fact that tourism expansion and environmental degradation are linked to investment in the provision of tourism facilities. Precisely because in the optimal solution the future is discounted, current generations are not disposed to make the necessary sacrifices in terms of current consumption that are needed to reach the green golden rule. Figure 3.5 compares the steady state of the optimal solution with the green golden rule.

Contrary to the case of the optimal solution, when the environmental and cultural costs of tourism expansion are external to the decision makers, the economy can end up in the long run with a more degraded environment than what would follow from the maximization of long-run welfare. This is what happens if:

$$\frac{\eta}{\varphi}\rho < \frac{\nu}{1 - L_T}[TR(L_T) + NTR(L_T)] - AL_T P'(L_T),$$

the condition that results from the combination of (3.21) and (3.22) and where the right-hand side is evaluated at the green golden rule level.[5] This condition is satisfied for low values of the rate of time preference and investment requirements per unit of land. In this situation the solution with

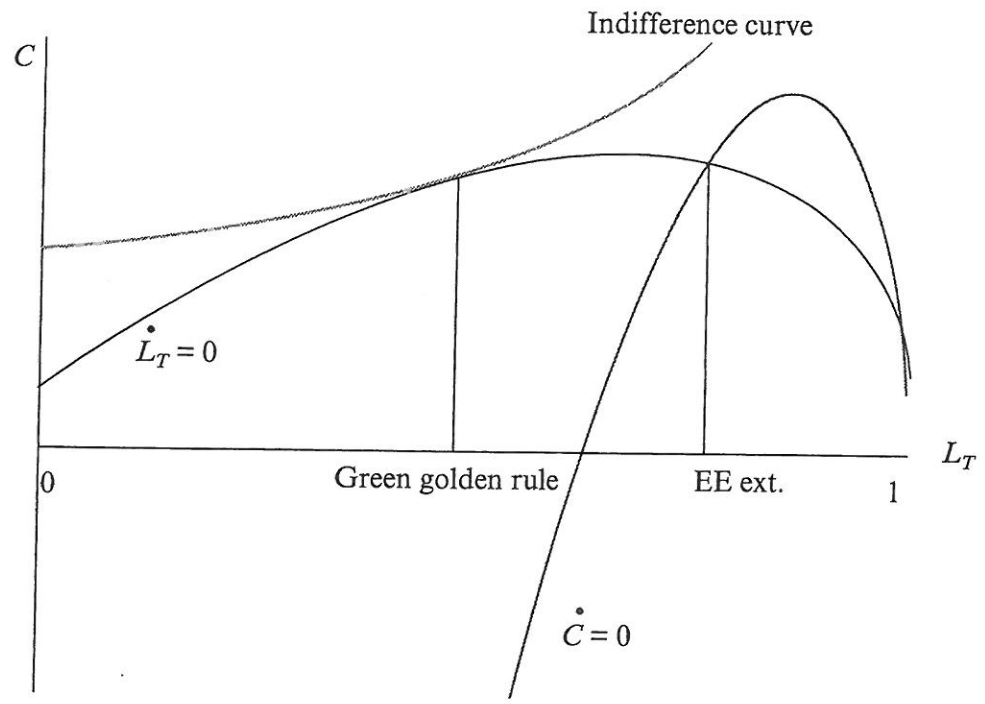


Figure 3.6 Steady state in the solution with externalities and green golden rule: a case of dynamic inefficiency

externalities is dynamically inefficient; that is, there are paths that imply higher welfare levels not only in the steady state but also during the transitional path and therefore long-term environmental degradation is not a symptom of intergenerational conflict but of inefficiencies due to the presence of external costs. Figure 3.6 represents a case where the solution with externalities implies excessive environmental degradation from the long-term welfare point of view.

6. CONTINUOUS GROWTH AND ENVIRONMENTAL DEGRADATION

As set up, the model does not allow for long-run growth based on endogenous factors. On the one hand, consistent with a large body of the literature that stresses the existence of a carrying capacity in the tourism resorts (see for instance Butler, 1980), quantitative growth based on the increase in accommodation capacity and the number of visitors is not possible given a limited amount of space[6] and cultural and environmental assets. On the other hand, the model is constructed in a way that qualitative growth, for instance through the increase in capital per unit of accommodation, is not possible.[7] Therefore, if we want to analyze the effects of continuous growth on the allocation of land we have to rely on exogenous forces. A good candidate is the price of tourism relative to manufactures. Thus, in this section we explore the behavior of the model in a situation in which factors exogenous to the economy raise this relative price.

This assumption seems reasonable given several facts observed during the last decades. Specifically, since the 1950s international tourism expenditures have experienced faster growth than world GDP. At the micro level tourism expenditure has increased its share in households' expenditure in most developed countries. This behavior can be related to a broader phenomenon consistent with a shift of expenditure shares from manufactures to services. As is commented by Rowthorn and Ramaswamy (1997), this can mainly be explained by a rise in the price of services relative to manufactures since in real terms the change of expenditure shares in manufactures and services is quite small. The increase in this relative price can be explained by the combination of two factors. On the one hand, Clark (1957) considers the hypothesis that income effects could increase relative demand for services after a threshold of economic development has been passed. On the other hand, the higher productivity growth that the manufacturing sector has experienced tends to lower the price of manufactures relative to services. Figure 3.7 shows the effects of both explanations for the case of the price of tourism relative to manufactures. On the vertical axis there is the international relative price per night stay for a given perceived quality. *RD* is international relative demand tourism/manufactures that shifts to the right due to income effects[8] or possible changes in preferences. *RS* is relative supply tourism/manufactures that shifts to the left due to higher productivity growth in the manufacturing sector. The combined

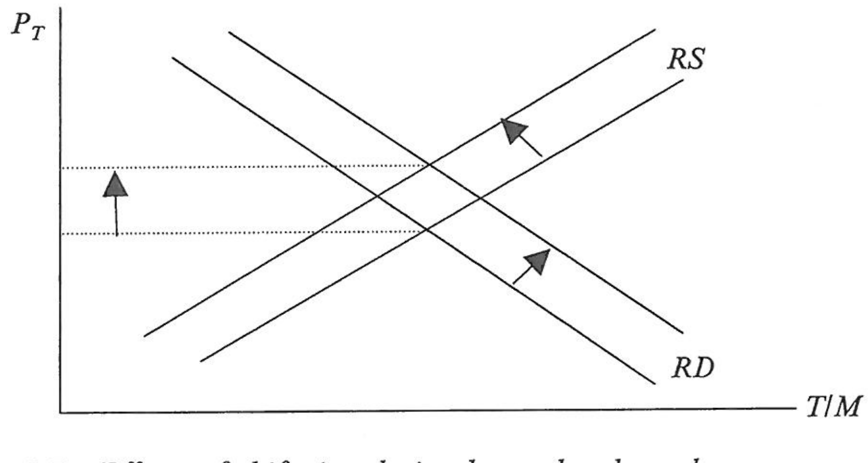


Figure 3.7 Effects of shifts in relative demand and supply tourism/manufactures on relative price of tourism

effect is an increase in the relative price of tourism for a given perceived quality of the tourism product and an increase of the share of tourism expenditure in total expenditures.[9]

Lanza and Pigliaru (1994) set up a model where the international price of tourism relative to manufactures rises continuously due to a lower productivity growth in the former sector. In their model this relative price is endogenous since the economy specialized in tourism is large in international markets (in fact, it is the sole supplier of tourism). In contrast, in our model the economy is small in the sense that variations in its supply of accommodation capacity have a negligible effect on world tourism supply. Therefore, what we assume is that the rise in the international tourism price relative to manufactures is exogenous from the point of view of the economy. Regarding the price of the output of the traditional sector relative to manufactures we continue to assume that it remains constant through time.

Therefore, let us consider the following:

$$P_T = \tau P(L_T)$$
$$\frac{\dot{\tau}}{\tau} = g, \;\; \tau(t = 0) > 0, \;\; g > 0,$$

where τ is a parameter whose growth reflects upward pressure on the relative price of tourism for any perceived quality of tourism services, that is, for any level of L_T.

Therefore we identify two determinants of the relative price of tourism supplied by the economy: on the one hand, several factors that push up the price of tourism relative to manufactures and affect all the tourism destinations and all the market segments; on the other hand, those factors specific to the tourism destination, that is, congestion, landscape and natural and environmental assets that determine the satisfaction of a tourist visiting the resort and his/her willingness to pay for tourism services given a level of τ.

In the following we analyze the effect on the allocation of land of the assumption that τ grows continuously. Specifically, we aim to answer two questions:

1. Is it socially optimal to limit the quantitative growth of the tourism sector?
2. When the costs of tourism expansion are external to the decision makers, is there any limit to the quantitative growth of the tourism sector?

With such an aim, we calculate the asymptotic steady state value of L_T in the optimal solution and in the solution with externalities when τ grows continuously.

6.1 Optimal Solution

Considering (3.11) and (3.12) and inserting the parameter τ, the following condition is satisfied in the steady state of the optimal solution:

$$\nu[\tau TR(L_T) + NTR(L_T)] = (1 - L_T)\left[\tau TR'(L_T) + NTR'(L_T) - \frac{\eta}{\varphi}\rho\right] \tag{3.24}$$

or:

$$\tau = \frac{(1 - L_T)\left[NTR'(L_T) - \frac{\eta}{\varphi}\rho\right] - \nu NTR(L_T)}{\nu TR(L_T) - (1 - L_T)TR'(L_T)}. \tag{3.25}$$

The asymptotic value of L_T consistent with a τ that tends to infinity is the value that makes the denominator of the previous expression equal to zero,[10] that is:

$$TR'(L_T)(1 - L_T) = \nu TR(L_T). \tag{3.26}$$

From this reasoning we can derive the following proposition:

Proposition 3. *When the international relative tourism price grows continuously the steady state value of L_T tends asymptotically to a value $\bar{L}_T \in (0, 1)$.*
Proof: see Appendix III.

Proposition 3 implies that even when the relative price of tourism and therefore the attractiveness of tourism relative to other productive sectors grow continuously, it is socially optimal to limit the quantitative expansion of the tourism sector before it reaches its maximum capacity.

To show the dynamics of tourism development with the new assumption, let us consider expression (3.14) again, where we have now inserted parameter τ:

$$\tau TR'(0) > \nu NTR(0) - NTR'(0) + \frac{\eta}{\varphi}\rho. \tag{3.14'}$$

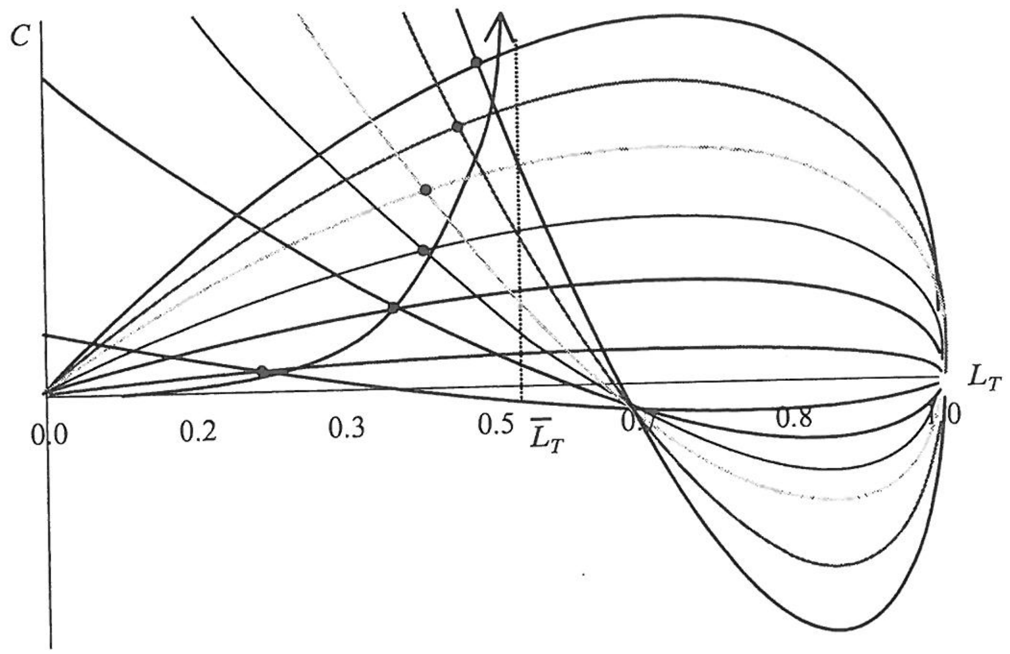
Remember that this expression is a necessary condition for a process of tourism development to be optimal. Therefore there is a threshold of τ under which it is not socially optimal to develop the tourism sector. If τ grows continuously, that condition will be satisfied sooner or later and from then on the economy will experience a non-balanced growth path characterized by an expansion of the tourism sector at the expense of the traditional sector.

Consumption and accommodation capacity grow but while the former grows continuously, the latter tends asymptotically to a level below the maximum capacity. Therefore we identify two sources of growth in the economy: sectoral change fueled by the reallocation of resources from other sectors to the tourism sector and exogenous improvements in the terms of trade of the economy. However, in the long term the former vanishes and only the latter remains. Figure 3.8 shows the behavior of the economy when τ grows continuously.

Notice that in the determination of $\bar{L}_T$ (expression 3.26), the traditional sector is absent. This is so because although this sector does not disappear (the asymptotic value of L_{NT} is positive), its share in the production value of the economy tends to zero as τ grows. Condition (3.26) has an interesting economic interpretation if we transform that expression into the following:

$$\tau TR'(L_T)[C^{-\theta}(1-L_T)^{\nu(1-\theta)}] = \nu C^{(1-\theta)}(1-L_T)^{\nu(1-\theta)-1}, \qquad (3.26')$$

where $(1-L_T)$ has gone to the right, we have multiplied both sides by $\tau C^{-\theta}(1-L_T)^{\nu(1-\theta)}$ and we have considered that, when τ grows, the asymptotic value of consumption is equal to the asymptotic level of tourism revenues since investment tends asymptotically to zero and the revenues from the traditional sector tend to a constant value.



Note: [a] Same functional forms and parameter values as in Figure 3.1.

Figure 3.8 Steady state in the optimal solution when τ grows continuously[a]

The left-hand side of (3.26′) represents the contribution to residents' utility of an additional unit of consumption that comes from a marginal transfer of land to the tourism sector, disregarding the loss in the output of the traditional sector. The right-hand side is the negative impact on residents' utility due to the loss of intangible assets associated with that marginal transfer of land. Expression (3.26′) therefore equates marginal costs and marginal benefits of an increase in the accommodation capacity of the resort, disregarding the effects on the traditional sector. In summary, even in a context where the economic attractiveness of tourism relative to the traditional sector increases continuously, full specialization in tourism is not socially optimal, but the preservation of the traditional sector is not based on its direct productive contribution but on its role in the preservation of cultural, environmental and natural assets that are valued by the residents and are a source of tourism revenues.

6.2 Solution with Externalities

From (3.18) and (3.19), and inserting the parameter τ, the following condition is satisfied in the steady state of the solution with externalities:

$$\frac{(1-L_T)}{\nu(1-\theta)}\left[\tau AP(L_T) + NTR'(L_T) - \frac{\eta}{\varphi}\rho\right] = 0,$$

which, for the interior steady state, implies:

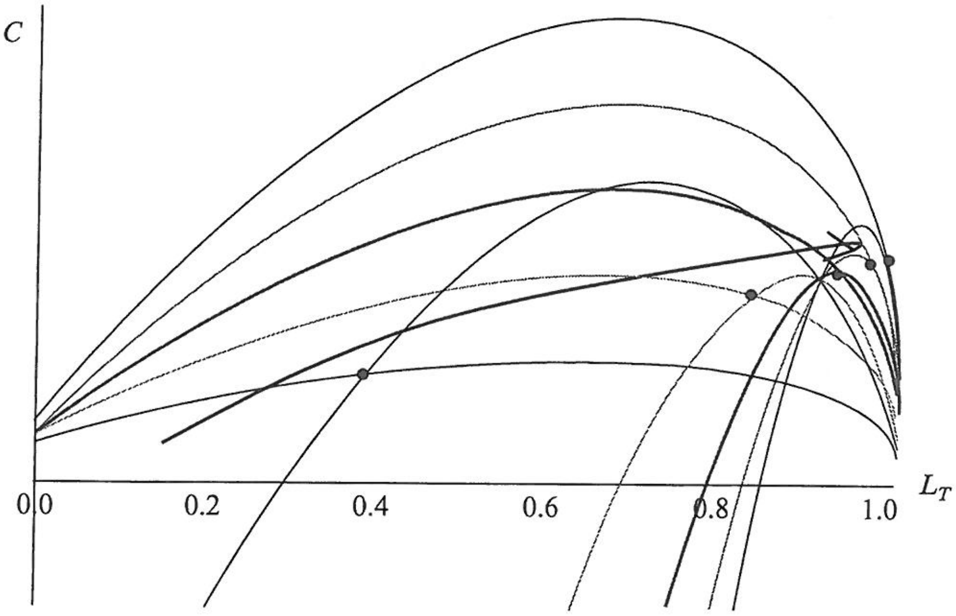
$$\left[\tau AP(L_T) + NTR'(L_T) - \frac{\eta}{\varphi}\rho\right] = 0$$

or

$$\tau = \frac{-NTR'(L_T) + \frac{\eta}{\varphi}\rho}{AP(L_T)}. \tag{3.27}$$

Proposition 4. *The value of L_T in the interior steady state of the solution with externalities tends asymptotically to its maximum value, unity, when the relative tourism price grows continuously.*

Proof: we know that $\lim_{L_T \to 1^-} NTR'(L_T) = -\infty$ and $\lim_{L_T \to 1^-} P(L_T) > 0$, a finite value. Therefore, in (3.27) $\lim_{L_T \to 1^-} \tau = \infty$. Moreover, in (3.27) τ is a monotonous function of L_T for $L_T \in [0,1]$ since $NTR''(L_T) < 0$ and $P'(L_T) < 0$. We then conclude that $\lim_{\tau \to \infty} L_T = 1$.



Note: [a] Same functional forms and parameter values as in Figure 3.1.

Figure 3.9 Steady state in the solution with externalities when τ grows continuously[a]

Proposition 4 implies that if the costs of tourism development are not considered by the decision makers, a continuous increase in the economic attractiveness of tourism relative to other sectors will generate incentives to expand tourism capacity with the only limit the total availability of land. The tourism sector fully crowds out other productive sectors even if full specialization in tourism is not socially optimal and society prefers to preserve part of the land from its occupation by tourism facilities not only as a source of amenities for the residents but also as a source of tourism revenues. Figure 3.9 shows the behavior of the economy with externalities when τ grows continuously.

7. CONCLUSIONS

In this chapter we have constructed a dynamic general equilibrium model of tourism development based on the reallocation of land from a low productivity traditional sector to its use in the building of tourism facilities, where that reallocation is associated with investment efforts to provide those facilities. Tourism expansion allows for increases in consumption capabilities but also implies a loss of cultural, natural and environmental assets linked to land used in the traditional sector that are positively valued not only by the residents but also by the tourists.

In this framework, the social optimal solution is obtained. We identify a condition for the tourism development to be socially desirable. If this condition is met, the optimal solution implies convergence to a steady state where land is only partially occupied by tourism facilities. During the transition to the steady state the economy experiences economic growth based on sectoral change. Tourism development stops before reaching its maximum capacity due to the positive valuation of cultural, natural and environmental assets by the residents, the negative effect on tourism revenues of the loss of those assets and decreasing returns to land in the traditional sector.

It has also been shown that when the costs of tourism expansion are external to the decision makers, tourism development is excessive from the point of view of the residents' welfare. It could even happen that a process of tourism development would take place without it being socially desirable. It is also possible to end up in the long term with an environmental degradation that is not compensated with high enough consumption. However, in case this is so, the reason is not a problem of intergenerational conflict, since lower tourism development would increase welfare not only in the steady state but also during the transitional path, but rather the fact that the costs of tourism development are not fully internalized.

Finally, we consider an exogenous growth factor, that is, the increase in the price of tourism relative to manufactures in the international markets. In this context, the economic attractiveness of tourism relative to the traditional sector grows continuously but society is interested in preserving the latter not because it makes a significant contribution to income but because land used in this sector contains the cultural, natural and environmental assets that are valued by the residents and have a positive influence on tourism revenues. However, if the costs of tourism expansion are not considered in the decisions of factors allocation, the traditional sector and those intangible assets that are linked to this sector tend to disappear asymptotically.

NOTES

* We acknowledge the financial support of the Govern Balear (grant PRIB-2004-10142).

1. Given that the number of visits to the tourism resort is proportional to L_T, the allocation of land could also be a good approximation of the degree of congestion. This would reinforce the negative effect of L_T on tourists' satisfaction.
2. Tisdell (1987) considers a similar relationship between willingness to pay of tourists and the number of visits on the grounds of a combination of bandwagon and congestion effects, where the former would dominate in situations of low number of visitors and the latter when the number of tourists is high enough.
3. This is what happens when consumption grows and, if marginal utility of consumption is increasing with L_T, when the tourism sector expands. As is shown below, this is what happens in the transitional dynamics of the model.
4. In Appendix I it is shown that the steady state is saddle-path stable.
5. From (3.22) it follows that in the green golden rule $AP(L_T) + ITN'(L_T) = (\nu/(1 - L_T))[IT(L_T) + INT(L_T)] - AL_TP'(L_T)$. Moreover, $AP'(L_T) + ITN''(L_T) < 0$.

6. As shown in the previous sections, growth stops before reaching the maximum capacity of the resort.
7. See Gómez et al. (2003) for a model where qualitative growth is allowed.
8. Crouch (1995, 1996) reports high income elasticity of tourism demand.
9. Smeral (2003) documents a continuous increase in the price ratio of tourism exports to exports of manufactured goods in industrialized countries since 1980.
10. There is no value of $L_T \in [0,1]$ for which the numerator is infinity.

REFERENCES

Brunstad, R.J., Gaasland, I. and Vardal, E. (1999), 'Agricultural Production and the Optimal Level of Landscape Preservation', *Land Economics*, **75**(4), 538–46.

Butler, R.W. (1980), 'The Concept of a Tourist Area Cycle of Evolution: Implications for Management of Resources', *Canadian Geographer*, **XXIV**(1), 5–12.

Clark, C. (1957), *The Conditions of Economic Progress*, London: Macmillan.

Crouch, G.I. (1995), 'A Meta-Analysis of Tourism Demand', *Annals of Tourism Research*, **22**(1), 103–18.

Crouch, G.I. (1996), 'Demand Elasticities in International Marketing. A Meta-Analytical Application to Tourism', *Journal of Business Research*, **36**, 117–36.

Drake, L. (1992), 'The Non-Market Value of the Swedish Agricultural Landscape', *European Review of Agricultural Economics*, **19**(3), 351–64.

Drake, L. (1999), 'The Swedish Agricultural Landscape. Economic Characteristics, Valuations and Policy Options', *International Journal of Social Economics*, **26**(7/8/9), 1042–60.

Fleischer, A. and Tsur, Y. (2000), 'Measuring the Recreational Value of Agricultural Landscape', *European Review of Agricultural Economics*, **27**(3), 385–98.

Gómez, C.M., Lozano, J. and Rey-Maquieira, J. (2003), 'Environmental Policy in a Dynamic Model of an Economy Specialized in Tourism', mimeo, University of the Balearic Islands.

Heal, G. (1998), *Valuing the Future*, New York: Columbia University Press.

Huybers, T. and Bennett, J. (2000), 'Impact of the Environment on Holiday Destination Choices of Prospective UK Tourists: Implications for Tropical North Queensland', *Tourism Economics*, **6**(1), 21–46.

Lanza, A. and Pigliaru, F. (1994), 'The Tourist Sector in the Open Economy', *Rivista Internazionale di Economiche e Commerciali*, **41**(1), 15–28.

López, R.A., Shah, F.A. and Altobello, M.A. (1994), 'Amenity Benefits and the Optimal Allocation of Land', *Land Economics*, **70**, 53–62.

Piga, C. (2003), 'Pigouvian Taxation in Tourism', *Environmental and Resource Economics*, **26**(3), 343–59.

Pruckner, G.J. (1995), 'Agricultural Landscape Cultivation in Australia: An Application of the CVM', *European Review of Agricultural Economics*, **22**(2), 173–90.

Rowthorn, R.E. and Ramaswamy, R. (1997), 'Deindustrialization: Causes and Implications', IMF Working Paper WP97/42.

Rubio, S.J. and Goetz, R.U. (1998), 'Optimal Growth and Land Preservation', *Resource and Energy Economics*, **20**(4), 345–72.

Smeral, E. (2003), 'A Structural View of Tourism Growth', *Tourism Economics*, **9**(1), 77–93.

Tisdell, C.A. (1987), 'Tourism, the Environment and Profit', *Economic Analysis and Policy*, **17**(1), 13–30.