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Ecotourism, Regional Development and Environmental Management

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1. Introduction

It seems impossible to investigate economic development without mentioning the impact of environmental factors. This is partly because environmental factors have suppressed the actual economic growth path after the mess of local and global environmental depletion and mainly because this depletion threatens the welfare of future generations. Accordingly, it is imperative to incorporate an environment-oriented framework or environmental constraints into an economic growth model even where that growth model is directed towards regional development. Regional development led by tourism should become an effective regional plan for protecting the natural environment.

This paper features a simple analytical framework with ecotourism in order to study how to pursue regional development without natural environment degradation, through adequate management systems and by showing that it may be an appropriate policy to promote ecotourism in a region as far as it enforces conservation of the regional natural environment. Our model framework of ecotourism incorporates a feedback or negative impact that stems from the use of natural environmental resources that are used to develop tourism in the region.

In this paper, we shall firstly study a static market structure for ecotourism to clarify how the demand for tourism services works to preserve the natural environment. Secondly, we shall mention the stability properties of the dynamic system and the effectiveness of regional management of the subtractive factors that adversely affect natural environmental preservation but which positively affect economic development.

2. Ecotourism and Regional Development

Ecotourism is generally defined as tourism to natural areas where environmental and cultural understandings are fostered. Because ecotourism must be ecologically sustainable with a primary focus on experiencing natural areas in a region, it is sometimes identified with "sustainable tourism". It is also true that ecotourism has been expected to be a key-player enforcing regional development to increase both per capita income and employment in the related region.

In Japan, we experienced a seriously disastrous development during what was known as the "bubble economy" of the 1980's. Vast monies were poured into building a large hotels and opening golf courses for making profits, but not for building up sound regional development. This tendency was clearly directed and enforced by the Japanese government who in 1987 enacted the "Resort Law" to promote rural tourism. After the bubble

collaps6ed, governmental failure or inaction has occurred. Negative decedent estates still remain at the regional or local government level. Although this may be a good lesson for the government, future generations are forced to inherit a lot of debts from our generations, including a deteriorated natural environment. This represents a failure to construct a sustainable development framework.

After the mess, the Japanese government altered its policy stance. A newly designed policy integrating the promotion of regional development with protection of the environment was launched in 1994, when the government set and enforced the so-called "Green-Tourism Law". This is aimed at accelerating development policy in rural agricultural areas through tourism and related services. Undoubtedly there will be a resurrection of both the just and the unjust, and we must keep monitoring the situation in order to prevent the latter. This is a major objective of this paper.

3. Market for Ecotourism Service

In general we travel for pleasure to places away from residential areas as these unusual areas foster environmental and cultural understanding, and provide a new experience. Therefore among factors determining demand in the tourism service sector, it is very important for a region to provide sufficient environmental and cultural resources to customers. However, it is also true that demand for the tourism service sector is strictly restricted by the spending capacity or income of the consumers who live outside of the region. After some manipulations, we can reach to the demand function for tourism. This is as given in the reduced form

$$(1)\quad y = y(p,N;A),\ \frac{\partial y}{\partial p} < 0,\ \frac{\partial y}{\partial N} > 0,\ \frac{\partial y}{\partial A} > 0,$$

where p is price, and N is the stock of natural environment and A is a vector containing policy parameters.

Examining the property of firm's production function concerning tourism service leads to

$$(2)\quad y^s = f(R, n(p,R;w)) = y^s(p,R;w),$$

where R is the natural resources provided by the natural environment, n is employment in the tourism sector and w is the wage rate. The temporal equilibrium of the tourism market is given by (1) and (2). In this paper, we shall assume that the price of tourism service is given and $p = p^*$.

4. An Optimal Management for Ecotourism

The next step is to think of the welfare of the region. We shall assume that in the region there are two components of the net welfare that the society wishes to maximize. One is the firm's profit, π, of the tourism service sector. This is given by

$$(3)\quad \pi = f(\phi(N;A), n(p^*,\phi(N;A);w)) - \frac{w}{p^*} n(p^*,\phi(N;A);w) - r\phi(N;A).$$

The second component is the welfare related to the subtractive factor. V(B) measures the value of net benefits (or losses) resulting directly from the subtractive factor. V(B) is assumed to be strictly concave and single peaked with $V(0)=0$, $V(B_0)=V_{max}$ and $V<0$ for $B>B_1$. It is also assumed that $V'(B)>0$ for $0<B<B_0$, $V'(B_0)=0$ and $V'(B)<0$ for $B>B_0$. Hence the social benefit (U) of the region will be given by

$$(4)\quad U \equiv U(N,B;A) = \pi(N;A) + V(B).$$

The cultural and natural environmental resources evolve over time according to the differential equation,

$$(5)\quad \dot{N} = h(N) - R - gB = h(N) - \phi(N;A) - gB,$$

where the first term of R.H.S. in (15) shows the self-anabiosis function of the regional common-pool resources and the second shows the depreciation of the stock. The last term is the social external cost of the subtractive factor and g means a marginal social cost in real terms to be paid. The steady state requires $h(N^*) - \phi(N^*;A) = gB^*$.

Welfare optimization by the regional social management can be attained by the following dynamic problem:

$$\text{Maximize}_{\{B\}} \int_0^\infty U(N,B;A)e^{-\rho t}dt$$

$$(RP)\quad \text{Subject to } \dot{N} = h(N) - \phi(N;A) - gB,$$

$$0 \le B(t),\ N(0) = N_0 \text{ given},$$

where ρ is the instantaneous social discount rate.

The subtractive factor of the region is the sole control variable in the problem (RP).

The current value Hamiltonian, H, related to (RP) is

(6) $H = \pi(N;A) + V(B) + \lambda[h(N) - \phi(N;A) - gB]$

where λ is the costate variable and the Lagrangean L is denoted by L = H+μB, where μ is the Kuhn-Tucker multiplier associated with the constraint on B. The combination of N, B and λ that maximizes H provides the solution to the problem. Necessary conditions are

(7) $V'(B) - g\lambda + \mu = 0$,

(8) $\dot{\lambda} = -\pi_N(N;A) + \lambda[\rho - h'(N) + \phi_N(N;A)]$

with postulated motion of state variable given by (5). The transversality condition related to the convergence of the solution is given by

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

Moreover the Kuhn-Tucker condition is

(10) $\mu \geq 0; \quad B \geq 0; \quad \mu B = 0$.

Equations (7) and (10) together can be summarized by

(11) $B = \begin{cases} 0 & if\ V'(0) < g\lambda \\ B^* & if\ V'(B) = g\lambda \end{cases}$.

If we assume the interior trajectories concerning controls, we can set μ=0 and follow the normal procedures of dynamic analysis. Differentiating (7) with respect to time and rearrangements of (8) yield (12)

$\dot{B} = \dfrac{-g\pi_N(N;A) + V'(B)[\rho - h'(N) + \phi_N(N;A)]}{V''(B)}$.

Equations (5) and (12) together construct the dynamic differential equations. After investigating dynamic property of the system, it is proved that there can be three interior steady states in the B-N space. However, because the discontinuity in the B isocline can occur irrespective of the value of g, the system with a sufficiently small g can be characterized by a unique steady state.

Of the trajectories, the social planner in the related region must follow the one leading to a steady state. However, there can be at least two candidate trajectories. Therefore she or he must decide and confirm the trajectory to be chosen. In doing so, it is helpful to make use of the methodology developed by Skiba (1978), and extensively applied by Brock and Starrett (1999) and Rondeau (2001). By following their procedure, it has been proven that regardless of the uniqueness of equilibrium, the optimal trajectory is the one directed towards the saddle point.

5. Ecotourism as the Virtue of Regional Development

A most important precondition to potential consumers of the ecotourism service in a region is that the region is secure, free and peaceful. However, even in a peaceful region, there will be some subtractive factors that directly affect the demand for ecotourism, in particular, and when they will actually give horns effects. Hence, provided the marginal social cost of subtractive factors is sufficiently large, they will reduce the equilibrium level of regional resource stock but increase the level of subtractive factors. This means that instead of decreasing demand for tourism due to a deterioration of regional resources, net benefits from subtractive factors will increase. Therefore it can be said that contradictions between the social planner's intentions and the outcome of pursuing an optimal regional management can occur.

It has been also shown that the society can attain a situation affluent in regional resources and can afford to provide more inputs directed to ecotourism service production. Further, this will lead society to manage a higher level of employment. Accordingly, all the social planner should do is direct or lead the society towards a steady state where cultural and natural environmental resources are sufficiently affluent to sustain the regional economy.

6. Concluding Remarks

By featuring a temporal short-run market model for ecotourism, it has been proven that equilibrium ecotourism service production is determined by factors, such as the stock of regional resources, as well as subtractive factors which can give negative effects on the evolution of regional

resources.

The major conclusion concerns how to manage these subtractive factors in the region so as to maximize regional welfare. The existences of multiple equilibrium as well as stability of the dynamic system depend primarily on the shape of the benefit function of the subtractive factors. It has been proven that an optimal trajectory towards a steady state exists and the social planner should follow it. To attain this process, the social planner must reduce subtractive factors drastically wherever subtractive factors are large enough at the initial condition. As far as the policy parameters are concerned, an important result is related to the tax rate on ecotourism service consumption. By reducing the tax rate, the region can attain increasing ecotourism service production and employment. However, this is conditional on the magnitude of the social marginal cost of subtractive factors.

In our model framework, the subtractive factor has played a decisive role to sustainable tourism. The regional social planner should dynamically adjust it for environmental preservation. It is clear that without eliminating such subtractive factors, the regional society is always forced to trade-off economic growth with environmental preservation. Therefore, it is necessary to determine how the subtractive factors impact the regional welfare to counteract its negative effect. Increasing potential for ecotourism in the regions without relying on subtractive factors can be a very favorable development. However this challenge remains.

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