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Recreation Specialization, Personal Input and Service Level

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Abstract: With increased attention paid to leisure time and much diversified interests developed in tourism, there have emerged various recreational activities that attract the eye of the many potential recreationists. The modern society begins to witness recreationists continue their involvement with recreational activities with a view to accumulating practical experience, improving activity skills and upgrading recreational specialization. In this socialization process, tourist firms play an important role, indeed. However, what is the better investment strategy for tourist firms to meet the rising demand of recreationists? This paper in application of optimal control theory seeks to construct a model, first of all, to describe the dynamic nature of recreational specialization process and accumulation of human capitals and resources, and secondly, to bring forth recommendation of adequate investment strategy for tourist firms. Findings include improving service speeds up accumulating process of recreational specialization capital.

Keywords: Recreational specialization; Personal inputs; Optimal control theory.

1. Introduction

With increased attention paid to leisure time and much diversified interests in tourism, there have emerged various recreational activities. Among them, those recreations in need of professional skills and characterized by adventuresome nature—rock climbing, gorge-walking, bungie jumping, cave exploration and canoeing, etc.—have been specifically welcomed by most people in the modern world.

However, in terms of recreational specialization, the relations between input in recreational facilities and service levels cannot be taken for granted.

In respect of recreationists, who seek to both have fun and advance their outdoor activity skills by taking part in certain recreational activities, time availability, budgets, prices, facilities safety and service quality provided by the tourist firms, and even equipment acquisition and self-study before departure are all the factors that will come into a potential recreationist's cautious equation.

With respect to tourist firms, they are challenged by resource in-put decisions including how to attract more recreationists by properly investing in facilities and service in a competitive environment where recreationists have many options when it comes to choosing a recreation firm.

To be sure, a sensational moment of self-achievement as a result of these exciting recreational activities are often affected by specific requirements of location, facilities, equipment and safety concern related either to recreationists' preparation and tourist firms' recreational input.

This paper as a consequence seeks to address two issues related to recreational specialization on recreationists and tourist firms. First, it explores recreationists' behavior on recreational specialization. Second, based upon the first potential finding, it investigates optimal decision making of tourist firms when they put in resources in recreational facilities, locations and services with a view to keeping their clients interested in their recreational products. Methodologically, given recreational specialization never happens overnight and it requires continual effort to accumulate practical experience and human capitals, the paper is to apply optimal control theory based upon the assumption that a research of recreational specialization could be properly made from a perspective of dynamic process.

2. Literature Review

Bryan regarded recreational specialization as a developmental process that entails a progression in behavior, attitudes, and preferences. Bryan (1977) Based upon an assumption that there exists a co-variance between recreationists' value of recreational activities and associated recreational specialization in recreationists' socialization process when taking part in recreational activities, Bryan was of the view that it is worth exploring a designated group that is engaged in specific recreational activities with a view to understanding attitude and behavior. He started his research into the degree of participation, fishing gears, fishing skills and impact of fishing

activities on life patterns by personal interviews and field observation of 263 trout fishermen and reached four points as follows: (a) Past experience can be one component that has co-variance with recreation preference. With the passage of time, recreational specialization will grow. (b) Interested recreationists will opt for varied leisure groups with their specific leisure value systems and sub-cultures. (c) Recreationists involved in recreational activities change their identity as consumers into one that care more about recreation quality and recreational environments. (d) Higher level of recreational specialization leads to better place attachment, activity understanding and special resources. These recreationists were found more articulate in their command of the recreational activities than lucked out (Bricker and Kerstetter (2000), Lee (1994)).

Kuentzel and McDonald looked at degrees of involvement into the recreational activities. They found that recreationists with lower involvement did not show particular interests in the recreational activities they took part in. They were therefore less willing to buy sophisticated well-appointed equipment needed by the advanced-level recreational activities. For those people highly involved with recreational activities in terms of time and budgets, they were more inclined to commit themselves to investing better equipment with higher preference for practical experience Kuentzel and McDonald (1992).

Based upon Bryan's findings, many researchers also investigated other dimensions of recreational specialization such as experience use history, centrality to lifestyle, social setting (Chipman and Helfrich (1988), Donnelly *et al.* (1986) Virden and Schreyer Virden and Schreyer (1988)). Methods of statistic analysis were ushered in on the degree of specialization in fishing, boating, and hiking activities.

Works by the Taiwanese researchers were also profound. Ou-yang surveyed the co-variance between birdwatchers' specialization level and place attachment and found that birdwatchers with different types of specialization in bird watching showed different preference for locality and service demands (Ou-yang (2002)). Chen also produced a similar result after investigating biker's levels of recreational specialization in Da-Du Mountains, Central Taiwan, and identification with the local environments (Chen (2004)). Ou, by adopting a structural formula, tested the concept of recreational specialization bearing on environment and reported that cognition, behavior and emotion displayed different significance in the process of recreational specialization (Ou (2004)). Lee and Hou after an intensive review of related literature examined personality and preference in the recreational specialization process and presented three sets of interpretation from the perspectives of emotive, behavioral and cognitive systems. What are worthy of note in their research was that the cognitive system included understanding about the environment of the recreational activities and familiarity with recreational facilities as well as resource-in-put conditions. The emotive system on the other hand refers to identification with the importance, contribution of the recreation engaged in, a sense of self-achievement and relative gains in ordinary life from the said recreation (Lee and Hou (2004)).

The above findings show that recreational specialization can be seen as a process in which a recreationist puts in resources in recreational activities at leisure time at a personal level. As Bryan also pointed out, the effort of recreational specialization was related to recreationists' inputs of their resources including time and money. While it is also deeply involved with practical experience as time goes by, the growth of recreational specialization has to be understood as a dynamic process across different timeframes (Bryan (1977)). In this process, recreationists in an attempt to elevate their recreational utilities, may improve their recreational specialization including practical experience and judging capability by investing in equipment and sustaining their engaged activities, which in turn effectively maximizes their recreational utilities, strengthens their cognition and value about the related environment, meets their demand from recreation, and accumulates practical experience and recreational skills.

Viewed in this light, this paper can be justified when it sees the extent of recreational specialization as a reflection of accumulated experience in a dynamic form, because accumulated practical experience normally serves as an important factor to choose recreation service and maximize recreational utilities. Indeed, it is often the recreationists' levels of recreational specialization that tourist firms take it as an important reference point for their further decision in providing services and doing promotions.

With the above understanding, the paper in the next section will rely on optimal control theory to address one of the challenges faced by the tourist firms today. That is: when many recreationists have increasingly demand more recreational utilities as a result of their improved recreational specialization, how should the tourist firms generalize recreationists' resource-input behavior and decide service prices and quality levels in their promotion strategy?

3. Modeling and Theoretical Analysis

3.1. The Model

As Bryan stated, recreational specialization is fundamentally characterized by a developmental process in which people invest their effort to grow themselves from amateurs to professionals. This section will first exploit this process-developing character and build an optimal control model in a duopoly market to present investment in facilities and services by tourist firms, who make decisions with reference to the recreationists' levels of recreational specialization. It will then present the covariance condition between recreationists' private resource in-put in recreational specialization and levels of services provided by tourist firms.

Suppose there is a scenic spot capable of providing recreational activities such as rock-climbing, bird watching, boating and biking. Let us assume that there are two tourist firms with similar nature that provide similar quality of recreational equipment and peripheral services including skill coaching, course counseling, safety maintenance and

meals. These two tourist firms are also determined to improve recreational facilities and streamline their services, believing that when recreationists gain better skills in recreational activities, they are more willing to buy more sophisticated recreational equipment, which in turn furthering the possibility of recreationists' revisiting and a snowballing effect. The decision-making pattern based upon optimal control modeling can thus be suggested below.

Suppose $s_i(t)$ to be the service level a recreational firm *i* provides within a *t* timeframe and $k(t)$ the accumulated amount of capital recreationists put in within the *t* timeframe. One assumed fact shows that most recreational activities such as rock-climbing and bird watching need designated facilities and location. In addition, contributing factors to economics of scale include better access, higher recreational specialization and satisfactory environments. All of these are costs to the tourist firms. With respect to the recreationists, cost refers to prices and invested resources put into the recreational activities and levels of recreational specialization even if they feel satisfied with the service provided by the tourist firms. Viewed in this light, suppose recreation utilities and experience capital are to be measured by the same unit and we omit the time argument t if no ambiguity arises, a function of recreation utilities with tourist firms *i* and various elements can be illustrated below:

$$U(k, I, p_i, s_i) = \beta - \alpha_1 p_i + \alpha_2 k + \frac{\alpha_3 s_i^2}{2} - \frac{\alpha_4 I^2}{2} \quad (1)$$

It is also found that people engaged in specialized recreational activities are often those with strong liking, professional knowledge and sophisticated equipment. The extent of liking, related knowledge, skills and the level of choice equipment can be defined as recreational specialization capital of a recreationist. The recreational specialization capital as mentioned above accumulates and varies as time goes by. Suppose vary ratio of the recreational specialization capital is a function of service provided by tourist firms, recreationists' frequency of attending the recreational activities and recreationists' investment of resources shown as $\dot{k} = \theta s_i - \delta k + \eta I$

In this first order liner differential equation, the regulated $\theta > 0$, $\eta > 0$ are two transformation parameters, separately representing service levels of tourist firms and recreational specialization capital placed by the recreationists, varying alongside the process of time.

We also suppose that there is high frequency of recreationists' attendance to the interested recreational activities. It is found that as attention has been frequently paid and experience capital is fully exploited, the parameter δ will be kept low, indicating that depletion rate of experience capital can be kept lower.

With the rise of consumers' sense for their rights and interests, most businesses take customer-oriented management strategy that prioritizes customers' satisfaction. This section will look at tourist firms' final objective to maximize present values accumulated from long term engagement of the recreationists when the tourist firms provide various levels of service suited for different demands of recreationists. Since this section takes service level as control variable and omits the price argument, price will be taken as constant, i.e., $p_i = p$

The model can be set as

$$\underset{s_i}{Max} \int_0^\infty e^{-\rho t}(\beta - \alpha_1 p + \alpha_2 k + \frac{\alpha_3 s_i^2}{2} - \frac{\alpha_4 I^2}{2})dt \quad (2)$$

s.t. $\dot{k} = \theta s_i - \delta k + \eta I$

$k(0) = k_0$

$\rho \in (0,1]$

First of all, we usher in variable and construct the current value Hamiltonian

$$H_1^c = (\beta - \alpha_1 p + \alpha_2 k + \frac{\alpha_3 s_i^2}{2} - \frac{\alpha_4 I^2}{2}) + \mu(\theta s_i - \delta k + \eta I) \quad (3)$$

Where the current value state variable is $k(t)$ while its initial value is k_0 when $t = 0$.

The Current value control variable is $s_i(t)$

The Current value costate variable is $\mu(t)$, which represents a shadow price corresponding to the source in-put level of recreationists who are seeking after recreational specialization. In other word, we can take $\mu(t)$ as marginal use values in a $k(t)$ timeframe. Initial condition is supposed to be $\mu(0) = \mu_0$.

3.2. Solution

Suppose an optimal solution is $[k^*(t), s_i^*(t), \mu^*(t)]$, it has to suit the first order necessary condition in the Pontryagin's maxim principle under boundary conditions as follows.

$$\frac{\partial H_1^c}{\partial s_i} = \alpha_3 s_i + \mu\theta = 0 \quad (4)$$

$$\frac{d\mu}{dt} = -\frac{\partial H_1^c}{\partial k} + \mu\rho = (\delta + \rho)\mu - \alpha_2 \quad (5)$$

$$\frac{\partial H_1^c}{\partial \mu} = \dot{k} = \theta s_i - \delta k + \eta I \quad (6)$$

which leads to

$$s_i = \frac{-\theta \mu}{\alpha_3} \quad (7)$$

With (6) and (7), we can arrive at

$$\mu^* = \frac{\alpha_2}{\delta + \rho}(1 - e^{(\delta+\rho)t}) + \mu_0 e^{(\delta+\rho)t} \quad (8)$$

To assess influence of recreational specialization to the recreationists' marginal utility value, depletion rate of capital and present value, partial differential equation can be set as follows.

$$\frac{\partial \mu}{\partial \delta} = \frac{\alpha_2}{(\delta+\rho)^2}\left(e^{(\delta+\rho)t} - 1\right) + te^{(\delta+\rho)t}\left(\mu_0 - \frac{\alpha_2}{\delta+\rho}\right) \quad (9)$$

if $\mu_0 > \frac{\alpha_2}{\delta+\rho}$, $\frac{\partial \mu}{\partial \delta} > 0$, then $\frac{\partial \mu}{\partial \rho} > 0$

By summarizing the above from observing (9), we produce the following propositions.

Proposition I:

If tourist firms set maximizing recreationists' utilities as the business objective,

(a) by setting in the recreationists' recreational specialization capital (k) a relative higher initial shadow price (μ_0) than transformation parameter (α_2), marginal utility value of recreational specialization capital (μ) will decrease or increase with the decrease or increase of depletion rate of recreational specialization capital (k) and (ρ).

(b) There exists a negative relation between μ and α_2 as time goes by that can be written as follows.

$$k' = k_0 e^{-\delta t} + (1 - e^{-\delta t})\frac{\theta s_i + \eta I}{\delta} \quad (10)$$

In this context, as tourist firms seek to influence accumulated results of recreationists' recreational specialization capital by switching service levels, the covariance can be described as follows.

$$\frac{\partial k'}{\partial s_i} = \frac{\theta}{\delta}(1 - e^{-\delta t}) \geq 0 \quad (11)$$

Proposition II:

If tourist firms set maximizing recreationists' utilities as one of their prior objectives, and under the condition that recreationists have already gained some experience in the process of recreational specialization,

(a) to elevate service level by tourist firms speeds up accumulation of recreation specialization capital.

(b) The longer tourist firms provide service to interested recreationists, the higher service quality provided and the more accumulated recreational specialization capital.

Then we can find the optimal solution as follows.

$$s_i^* = \frac{-\theta}{\alpha_3}\left(\frac{\alpha_2}{\delta+\rho}(1 - e^{(\delta+\rho)t}) + \mu_0 e^{(\delta+\rho)t}\right) \quad (12)$$

$$K^* = \frac{1}{\delta}(1 - e^{-\delta t})(\eta I - \frac{\theta^2}{\alpha_3}(\frac{\alpha_2}{\delta+\rho}(1 - e^{(\delta+\rho)t}) + \mu_0 e^{(\delta+\rho)t})) + k_0 e^{-\delta t} \quad (13)$$

3.3. System Stability

The dynamic process of the optimal control modeling can be shown in matrix form as

$$\begin{bmatrix} \dot{k} \\ \dot{\mu} \end{bmatrix} = \begin{bmatrix} -\delta & 0 \\ 0 & \rho \end{bmatrix}\begin{bmatrix} k \\ \mu \end{bmatrix} + \begin{bmatrix} \theta s_i + \eta I \\ \delta - \alpha_2 \end{bmatrix} \quad (14)$$

The system will exhibit a unique saddle point steady state because Jacobian matrix reaches

$$|J| = -\delta\rho < 0 \quad (15)$$

4. Conclusions

Recreational specialization theories seek to address recreation- activity recreationists' preferences, motivations, attitude and the developing processes of specialization. Based upon these theories, this paper in application of optimal control theory constructs a model to describe the dynamic nature of recreational specialization process and

accumulation of human capitals and resources. After observing the management strategy of the tourist firms and pricing analysis, this paper reports the conclusions as follows.

On the one hand, if tourist firms can provide quality service, recreationists engaged in the recreation activities are more capable of developing their recreational skills and accumulating recreational specialization capital as a result of constant demand for unique location and service in recreational activities. On the other hand, as frequent participation in recreational activities offered by tourist firms can lower the depletion rate in recreational specialization capital, service provided by tourist firms is a contributing factor to accumulation of recreational specialization capital. In a longer term, however, no matter how great extent tourist firms improve their service, its contribution to accumulate recreationists' recreational specialization capital remains limited.

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