A GAME-THEORETIC APPROACH TO CHOICE OF PROFIT AND REVENUE MAXIMIZATION STRATEGIES IN TOURISM SUPPLY CHAINS FOR PACKAGE HOLIDAYS

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ABSTRACT

Enterprises in a tourism supply chain (TSC) often optimize their businesses by adopting and operating profit or revenue maximization strategies. This paper investigates the conditions under which these strategies are preferred. We consider a TSC consisting of three sectors: a theme park operator, tour operators and accommodation providers. Simultaneous non-cooperative games are used as decision models of individual enterprises within the same sector while a two-stage sequential game is used to coordinate tourist quantities between the three sectors that form the two layers of the TSC. The theme park determines the admission price, while the accommodation sector achieves market clearing prices through quantity competition. After learning the decisions of the theme park and the accommodation sector, the tour operator sector decides final price of package holiday through quantity competition. Several observations are derived from equilibrium solutions. First, tour operators and accommodation providers that select the revenue maximization strategy obtain larger market shares and profits than those that select the profit maximization strategy, while the theme park operator generally prefers enterprises in the other two sectors to select the revenue maximization strategy. Second, the profit maximization strategy is a better choice when all enterprises in each of the sectors choose the same strategy. Finally, if tour operators and accommodation providers are free to choose their own strategies, there is a market equilibrium where profit and revenue maximization strategies could coexist.

Keywords: tourism supply chain; package holidays; game theory; profit maximization; revenue maximization.

INTRODUCTION

Tourism industry has enjoyed rapid developments in recent years. This is particularly true for the emerging economies such as China including Hong Kong and Macau. Inbound tourists from mainland China are particularly interested in package tours consisting of core components such as theme park, tourist sites, and shopping experiences. A complex supply chain has developed in Hong Kong tourism and hospitality industries. Travel agents and tour operators compete with each other on the one hand, and coordinate between various service providers on the other hand, during the process of configuring most suitable package holidays. A tourism supply chain (TSC) typically comprises the suppliers of all the goods and services that go into the delivery of tourism products to consumers (Tapper and Font 2007). Enterprises in a tourism supply chain (TSC) often optimize their businesses by adopting and operating profit or revenue maximization strategies. A question is under what conditions a specific strategy is preferred.

The literature on firm behavior in the mainstream economics is rich. Perhaps the most important assumption is that an enterprise is to maximize profits strategically according to Hirshleifer (1980). However, this pure profit maximizing strategy has been criticized by Baumol (1967) and Nicholson (1995). They argue that an enterprise may maximize sales as a long-term survival strategy. Enterprises in Tourism and Hospitality industry have also practiced different strategies of maximizing profits and/or revenues (Collins and Parsa 2006). A profit-maximizing tourism enterprise may compete in a mature market, has a stable market share, and at the same time is popular with tourists. Such a profit-maximizing decision is normally influenced by shareholders who expect steady increases in profits. With an increasing demand for tourism in many destinations, tourism enterprises also adopt the revenue-maximization strategy to increase market shares through introducing new products/services. Furthermore, while shareholders/owners of large tourism enterprises are generally more interested in profitability, the managers of these tourism enterprises are more concerned with revenue growth and prestige, which depend very much on the expansion of their businesses than profit (Yakov and Jacob, 1979). Generally speaking, tourism enterprises may adopt both profit maximization and revenue maximization strategies, but only one needs to dominate at a specific operational stage. For example, a firm could adopt a revenue-maximizing strategy subject to a minimum profit constraint.

This paper aims to investigate strategy choices of enterprises in TSC for package holidays. We consider a TSC with two layers or echelons structure. In the upstream layer, there are multiple accommodation providers and a theme park. They provide services for the downstream TSC. A number of tour operators at the downstream layer are responsible for configuring and packaging holiday products, then sell them to targeted tourists. The prices of package holidays consist of the payment for accommodation and the admission charges to the theme park. In order to simplify the game-theoretic model for the analysis, other sectors such as transport are not included in this study. They can be considered in a similar way in which the accommodation sector is considered in this study.

This paper considers two strategies: profit maximizing strategy and revenues maximizing strategy. Each tour operator or accommodation provider within the TSC is assumed to make its own strategy choice freely. In the chosen TSC, it is assumed that a monopoly theme park operator dominates the industry. This dominant theme park is able to exert a significant degree of control over the price and gain steady profit. There is no need for this theme park to compete for the market share. Its market size is directly affected by its pricing strategy. Therefore, this theme park can be considered as a profit-maximizer. We are interested in the following questions:

(1) What impacts would the strategies of maximizing profits and revenues have on tour operators, accommodation providers and the theme pack operator, respectively?

(2) What is the most beneficial strategy for individual enterprises, the sectors, and the entire TSC and what are the conditions associated with such a strategy?

(3) Could individual enterprises practice different strategies in the same supply chain and what are the conditions for such co-existence?

In order to address these research questions, this paper proposes a two-stage game framework. The theme park operator determines its admission fees. Meanwhile, accommodation providers compete with each other within the same sector, and determine the market equilibrium price through quantity competition. Informed with the prices from the upstream businesses, tour operators decide their strategies. The equilibrium price for package holidays are then reached also through quantity competition. The two-stage game is solved in a bottom-up fashion, i.e. backward induction. Given the demand faced by the tour operators, each of them simultaneously determines the number of tourists they would like to attract in order to maximize its profit or revenues. Aggregating the equilibrium quantities of tourists for all tour operators gives the best response functions (demand curves) for accommodation providers and the theme park operator. Following the same procedure for the accommodation sector, and combining the result from the theme park, the overall equilibriums can solved for the TSC under consideration.

Although game theory has been widely used in studying manufacturing supply chain problems, it has rarely been used in tourism with only a few exceptions. Taylor (1998) introduces a game matrix and analyzed a tour operator's mixed price strategy; Chung (2000) examines the pricing strategy and business performance of super deluxe hotels in Seoul by modifying the prisoner's dilemma game model. Wie (2003) formulates a dynamic game model of strategic capacity investment in cruise line industry. Bastakis, Buhalis, and Butler (2004) present a bargaining game with asymmetric information to analyze relationships between tour operators and small-medium sized tourism accommodation enterprises. Recently, Garcia and Tugores (2006) propose a two-stage duopoly game model in which hotels competed in both quality and prices. These references mainly focus on single tourism sectors. In contrast, our study focuses on three sectors organized in two echelons.

The rest of the paper is organized as follows. Section 2 presents the model and the equilibrium solution. Section 3 discusses the strategy choices of enterprises in TSC in different situations. Section 4 presents a number of useful managerial implications derived from the numerical examples. General conclusions are given in Section 5. Proofs of theorems with more mathematical details are provided in Appendices due to space constraints.

METHOD

The TSC for package holidays includes three sectors, namely the tour operators (TOs), accommodation providers (HAs), and a theme park operator (TP). There is only one TP while multiple TOs and HAs are involved in the TSC. TP provides key activities for tourists to visit, and HAs supply accommodation for tourists. TOs are responsible for packaging the holidays together for tourists with options from the services provided by the TP and HAs. For the sake of simplicity, we assume that all tourists will visit the TP when they join the package holidays. This means that tourists do not obtain tickets directly from the TP operator. Those who obtain tickets directly from the TP operator do not require hotel accommodation and therefore are not included for consideration in our model. TOs and HAs are grouped into sectors. The two-echelon structure can be represented as a tree with each sector represented by a node (see figure 1).

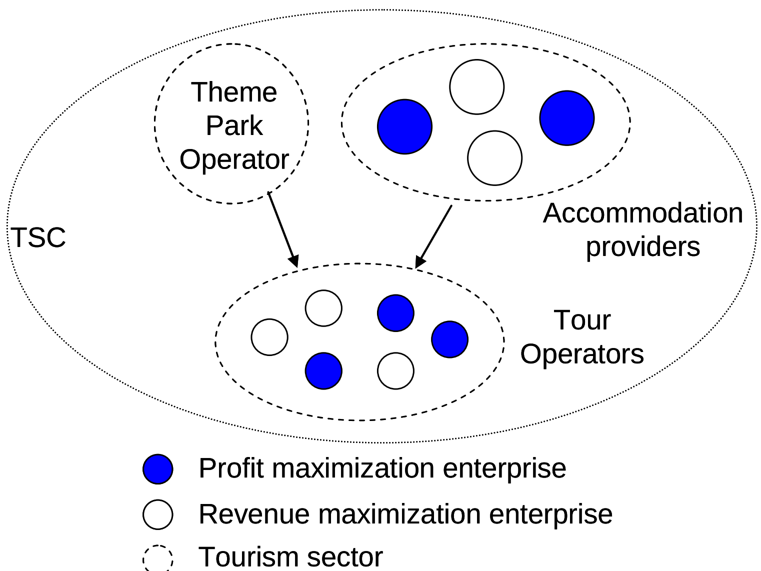

Figure 1. The Tourism Supply Chain

Each TO/HA in this TSC has two strategies: profit maximizing strategy (P-strategy) and revenues maximizing strategy (R-strategy). Enterprises in the TSC are assumed to play a two-stage sequential game:

Stage 1: TP first decides the admission price, and each HA determines its operation strategy and optimal service quantities according to the strategy selected.

Stage 2: After observing the strategies adopted by TP and HAs, then each TO determines its operation strategy and quantities of package holidays through competition.

The quantity competition between enterprise within a sector such as the accommodation sector or the tour operator sector is modeled as a simultaneous non-cooperative game often called Cournot game. In such a game, each enterprise aims to maximize profits, based on the expectation that its own output decision will not have an effect on the decisions of its rivals. Enterprises do not cooperate and choose production quantities independently and simultaneously. Price is negatively related to the total output, as suggested by standard economic theory.

In the mathematical formulation, there are N TOs and M HAs in the TSC, indexed by $i=1...N$ and $j=1...M$. The subscript (P and R) is used to distinguish the entities in the TSC using different operation strategies. For example, TO_R is the TOs that adopt the R-strategy, N_R is the number of TO_R s and $n_R=\frac{N_R}{N}$ is the market ratio in the TO sector. The strategy sets of TOs and HAs are denoted by $X=(X_i,X_{-i})$ and $Y=(Y_j,Y_{-j})$ in space $\{P,R\}^N$ and $\{P,R\}^M$ respectively, where $i=1...N$, $j=1...M$. X_{-i} and Y_{-j} represent strategy sets of TOs and HAs excluding TO_i and HA_j. Unit cost of TP, HA, and TO are c, c_2 and c_1, while price of TP, HA, and TO are p, p_2 and p_1. Without loss of generality, we assume a linear inverse price function for TO_j, that is, $p_1^j=\alpha-\beta Q$, where Q is the total number of tourists. The linear price function is broadly used in the manufacturing supply chain studies (Carr and Karmarkar 2005; Xiao and Yu 2006) as well as in tourism and hospitality literature (Zheng 1997; Wie 2005). The parameter α presents the market size and $\alpha>c+c_1+c_2$. β is quantity-sensitivity and this means that an increase in tourist quantities will lead to decrease in price in a competitive environment.

The Model for TOs

The profit function of TO_i is $\pi_1^i = q_1^i(p_1^i - p - p_2 - c_1^i)$, and the revenue function of TO_i is $R_1^i = q_1^i(p_1^i - p - p_2)$, where c_1^i is the unit cost of TO_i. Taking the first and second derivatives with respect to q_1^i, we get the optimal quantities:

$$q_1^i = \begin{cases} \dfrac{\alpha - p - p_2 - c_1^i}{2\beta} - \dfrac{1}{2}\sum_{k \neq i} q_1^k, & i \in TO_P \\ \dfrac{\alpha - p - p_2}{2\beta} - \dfrac{1}{2}\sum_{k \neq i} q_1^k, & i \in TO_R \end{cases}$$

Sum up quantities for all TOs, the total number of tourists that all TOs service can be expressed as:

$$Q = \frac{(\alpha - p - p_2 - n_P c_{1P})N}{\beta(N+1)}, \text{ where } c_{1P} = \frac{\sum_{i \in TO_P} c_1^i}{N_P} \qquad (1)$$

The Model for HAs

From equation (1), a demand curve for HAs is $p_2 = \alpha - p - n_2 c_{1P} - \dfrac{Q\beta(N+1)}{N}$. Applying the same logic as for TOs, the profit function and the revenue function for HA_j are $\pi_2^j = q_2^j(p_2 - c_2^j)$ and $\pi_2^j = q_2^j p_2$ respectively, where c_2^j is unit cost of HA_j. If following quantities are decided, HAs have no incentive to deviate those selections.

$$q_2^j = \begin{cases} \dfrac{\alpha - p - n_P c_{1P} - c_2^j}{2\beta(N+1)} N - \dfrac{1}{2}\sum_{i \neq j} q_2^i, & j \in HA_P \\ \dfrac{\alpha - p - n_P c_{1P}}{2\beta(N+1)} N - \dfrac{1}{2}\sum_{i \neq j} q_2^i, & j \in HA_R \end{cases}$$

Sum up quantities for all the HAs, the total number of tourist of HAs is

$$Q = \frac{MN(\alpha - p - n_P c_{1P} - m_P c_{2P})}{\beta(M+1)(N+1)}, \text{ where } c_{2P} = \frac{\sum_{j \in HA_P} c_2^j}{M_p} \qquad (2)$$

The Model for TP

From equation (1), the TP's admission price is $p = \alpha - p_2 - n_P c_{1P} - \dfrac{Q\beta(N+1)}{N}$. Assuming the TP maximizes its profit $\pi_3 = Q(p-c)$, the optimal number of visitors to TP is:

$$Q = \frac{N(\alpha - p_2 - n_P c_{1P} - c)}{2\beta(N+1)} \tag{3}$$

Model Equilibriums

Combining (2) and (3), the following equilibrium solutions can be obtained:

for TP: $Q = \frac{NM(\alpha - c - n_P c_{1P} - m_P c_{2P})}{\beta(2M+1)(N+1)}$; $\pi_3 = \frac{M^2 N(\alpha - c - n_P c_{1P} - m_P c_{2P})^2}{\beta(2M+1)^2(N+1)}$.

for $i \in TO_P$: $q_1^{iP} = \frac{Q}{N} + \frac{n_P c_{1P} - c_1^i}{\beta}$, $\pi_1^{iP} = \beta(\frac{Q}{N})^2 + \frac{2Q}{N}(n_P c_{1P} - c_1^i) + \frac{(n_P c_{1P} - c_1^i)^2}{\beta}$.

for $i \in TO_R$: $q_1^{iR} = \frac{Q}{N} + \frac{n_P c_{1P}}{\beta}$, $\pi_1^{iR} = \beta(\frac{Q}{N})^2 + \frac{Q}{N}(2n_P c_{1P} - c_1^i) + \frac{n_P c_{1P}}{\beta}(n_P c_{1P} - c_1^i)$.

for $j \in HA_P$: $q_2^{jP} = \frac{Q}{M} + \frac{N(m_P c_{2P} - c_2^j)}{\beta(N+1)}$,

$$\pi_2^{jP} = \frac{\beta(N+1)}{N}(\frac{Q}{M})^2 + \frac{2Q}{M}(m_P c_{2P} - c_2^j) + \frac{N(m_P c_{2P} - c_2^j)^2}{\beta(N+1)}.$$

for $j \in HA_R$: $q_2^{jR} = \frac{Q}{M} + \frac{N m_P c_{2P}}{\beta(N+1)}$,

$$\pi_2^{jR} = \frac{\beta(N+1)}{N}(\frac{Q}{M})^2 + \frac{Q}{M}(2m_P c_{2P} - c_2^j) + \frac{N m_P c_{2P}}{\beta(N+1)}(m_P c_{2P} - c_2^j).$$

The following definition is used throughout the rest of the paper.

DEFINITION 1. Given other HAs' (TOs') strategies, if $\pi_{1i}(X_i, X_{-i}^*) \le \pi_{1i}(X_i^*, X_{-i}^*)$ ($\pi_{2j}(Y_j, Y_{-j}^*) \le \pi_{2j}(Y_j^*, Y_{-j}^*)$ for $\forall i = 1...N$ ($\forall j = 1...M$), then (X_i^*, X_{-i}^*) (Y_j^*, Y_{-j}^*) is the TO (HA) Nash Equilibrium, and n_P^* (m_P^*) is the equilibrium market ratio (EMR).

This definition means that if a TO or HA is in the Nash equilibrium, it has no incentive to unilaterally change its strategy. In other words, the equilibrium strategy is its optimal choice given others' strategies. Any changes would reduce profits. For simplicity, we assume that all TOs or HAs are identical in the following discussions.

FINDINGS

Based on the above equilibriums, we first identify the impact of different strategy choices on the performance of TOs, HAs and the TP. The results are presented below:

> **PROPOSITION 1**. (1) Output shares and profits for TOs or HAs that choose R-strategy are greater than those that adopt the P-strategy; (2) TP benefits from the R-strategy adopted by the TOs and HAs.

Let us consider a simple scenario where all enterprises in the same sector use the same strategy. That is, all the TOs and HAs formed strategic alliances in their respective sectors, so that their decisions are consistently coordinated. Four possibilities are considered here. (1) all TOs and HAs choose the P-strategy; (2) all TOs choose the P-strategy and all HAs choose the R-strategy; (3) all TOs choose the R-strategy and all HAs choose the P-strategy; (4) all the TOs and HAs choose the R-strategy. The profits of TOs or HAs under these four considerations can be easily derived based on the results from the previous section. They are listed in the game matrix shown in Table 1.

Table 1 Game Matrix

		HA	
		P-Strategy	R-Strategy
TO	P-Strategy	(π_1^{PP}, π_2^{PP})	(π_1^{PR}, π_2^{PR})
	R-Strategy	(π_1^{RP}, π_2^{RP})	(π_1^{RR}, π_2^{RR})

where

$$\pi_1^{PP} = \frac{M^2(\alpha - c - c_1 - c_2)^2}{\beta(2M+1)^2(N+1)^2}; \pi_2^{PP} = \frac{N(\alpha - c - c_1 - c_2)^2}{\beta(2M+1)^2(N+1)};$$

$$\pi_1^{RP} = [\frac{M(\alpha - c - c_2)}{(2M+1)(N+1)} - c_1]\frac{M(\alpha - c - c_2)}{\beta(2M+1)(N+1)};\ \pi_2^{RP} = \frac{N(\alpha - c - c_2)^2}{\beta(2M+1)^2(N+1)};$$

$$\pi_1^{PR} = \frac{M^2(\alpha - c - c_1)^2}{\beta(2M+1)^2(N+1)^2};\ \pi_2^{PR} = (\frac{\alpha - c - c_1}{2M+1} - c_2)\frac{N(\alpha - c - c_1)}{\beta(2M+1)(N+1)};$$

$$\pi_1^{RR} = [\frac{M(\alpha - c)}{(2M+1)(N+1)} - c_1]\frac{M(\alpha - c)}{\beta(2M+1)(N+1)};\ \pi_2^{RR} = (\frac{\alpha - c}{2M+1} - c_2)\frac{N(\alpha - c)}{\beta(2M+1)(N+1)}.$$

LEMMA 1. $\pi_1^{PR} > \pi_1^{RR} > \pi_1^{RP}, \pi_1^{PR} > \pi_1^{PP} > \pi_1^{RP}, \pi_2^{RP} > \pi_2^{RR} > \pi_2^{PR}, \pi_2^{RP} > \pi_2^{PP} > \pi_2^{PR}$.

THEOREM 1. The unique Nash Equilibrium of the above game matrix exists when all TOs and HAs choose the P-strategy.

Next, we investigate a common scenario where TOs and HAs freely choose their strategies. The following theorem gives the sufficient and necessary condition for the Nash Equilibrium in the TO sector:

THEOREM 2. The sufficient and necessary condition for (X_i^*, X_{-i}^*) to be in the Nash Equilibrium in the TO sector is when EMR n_P^* satisfies $n_P^* \in [n_P^-, n_P^+] \bigcap [0,1]$,

where

$$n_p^- = \frac{1}{1-k} + \frac{1-k}{N(N-2+2k)} - \frac{(\alpha - c - m_P c_{2P})k}{c_1(1-k)},$$

$$n_p^+ = \frac{1}{1-k} + \frac{(N-1+k)}{N(N-2+2k)} - \frac{(\alpha - c - m_P c_{2P})k}{c_1(1-k)}, \text{ and } k = \frac{M}{(2M+1)(N+1)}.$$

Similar to Theorem 2, a new theorem for the HA sector could be derived:

THEOREM 3. The sufficient and necessary condition for (Y_j^*, Y_{-j}^*) to be in the Nash Equilibrium in the HA sector is when EMR m_P^* satisfies

$m_P^* \in [m_P^-, m_P^+] \bigcap [0,1]$,

where

$$m_p^- = 1 + \frac{1}{2M} + \frac{2}{M(2M-3)} - \frac{\alpha - c - n_P c_{1P}}{2Mc_2}$$

$$m_p^+ = 1 + \frac{1}{2M} + \frac{2M-1}{M(2M-3)} - \frac{\alpha - c - n_P c_{1P}}{2Mc_2}.$$

The numbers of enterprises included in the TO sector and HA sector are often large. For example, a large number of tour operators in mainland China run tour business to a theme park in Hong Kong, and there are plenty of hotels serving tourists in Hong Kong. Under this condition, we can get the following corollary:

COROLLARY 1. All the TOs and HAs choose P-strategy when conditions $N \to \infty$ and $M \to \infty$ are hold.

This corollary is intuitive: as $[m_P^-, m_P^+]$ and $[n_P^-, n_P^+]$ converge to 1 when N and M become infinite. It presents the perfect competition market in which the equilibrium price is equal to unit cost and all TOs and HAs only earn normal profits.

As is common in the industrial organization literature, social planers often care about the sector welfare or total sector surplus (Garcia and Tugores 2006). Welfare function or total sector surplus is defined as the sum of profits of all enterprises in the sector.

The surplus for the TOs is: $\Pi_{TO} = N_p \pi_1^P + N_R \pi_1^R$

The surplus for the Has is: $\Pi_{HA} = M_P \pi_2^P + M_R \pi_2^R$

Maximizing a sector's surplus, one can easy get the following proposition:

PROPOSITION 2. P strategy is the optimal choice for the TO and HA sectors.

Similar to the definition of the sector welfare, the supply chain welfare or supply chain surplus is $\Pi_{Chian} = \Pi_{TO} + \Pi_{HA} + \pi_3$. The following proposition gives the optimal strategy choices when the supply chain welfare is maximized.

PROPOSITION 3. In the context of the entire supply chain, the optimal strategy choices for TOs (n_P) and HAs (m_P) satisfy $\frac{\alpha - c - n_P c_1 - m_P c_2}{\alpha - c - c_1 - c_2} = \frac{(2M+1)(N+1)}{2MN}$.

APPLICATION OF RESULTS

The previous section presents the theoretical results of strategy choices in different scenarios. Numerical examples are presented in this section to give a better understanding of the theoretical findings. Managerial implications are also derived and discussed.

Proposition 1 presents the impact of different strategies on the performance of tourism enterprises. Under the perfect competition condition, tourism firms that choose the R-strategy would serve more tourists than they adopt the P-strategy. This would also result in more than average profits and market shares. Additionally, we also observe from the equilibriums that an enterprise with higher unit cost will have a lower market share when the P-strategy is adopted. This is consistent with common sense that an inefficient enterprise can not perform well. Given our assumption that all package tourists visit the theme park, TP would be very profitable if more TOs/HAs choose the R-strategy.

When all enterprises in the same sector choose the same strategy, Theorem 1 shows that P-strategy is the optimal for either TOs or HAs under the condition where enterprises are coordinated in deciding their strategies. The remaining question is whether this optimality is valid for the TO and HA sectors. Proposition 2 gives a positive answer to this question. That is, when all enterprises choose the P-strategy, all sectors would maximize their profits.

However, tourism enterprises may behave differently under various operational situations, especially when the number of enterprises in the sector is large. In this case, coordination is impractical. We are interested in whether the Nash Equilibriums exist in the tourism supply chain and under what condition if they exist. Example 1 illustrates an unbalanced market.

EXAMPLE 1: There are 8 TOs and 5 HAs in the TSC. TOs and HAs have identical unit costs $c_1 = 2$ and $c_2 = 4$, respectively. Demand parameters α, β and the unit cost of TP c are 40, 1.5 and 3, respectively. Three TOs and three HAs adopt P-strategy. Since the profit of TO/HA that adopt R-strategy is greater than that of TO/HA that choose P-strategy, the P-strategy enterprises have incentive to change their strategies. The similar question also arises in view of the R-strategy enterprises. The computational result shows that the TO that takes P-strategy would change its strategy, under the assumption that other TOs would keep their strategies unchanged. If this happens, this TO's profit would increase from 0.141 to 0.329. Similar to the HA sector, the HA who switch from the P-strategy to the R-strategy increases its profit from 1.293 to 2.111. It becomes clear that there is a strong incentive for TOs/HAs to change their strategies.

The above example clearly shows that tourism enterprises with either the P-strategy or the R-strategy do not necessarily stick to the same strategies all the time. The change of strategy by a firm would be on the assumption that others would keep their strategy unchanged. It is unclear however from this example, who and how many TOs or HAs would change their strategies. Theorem 2 and 3 jointly give the sufficient conditions for the Nash Equilibrium in the TO sector and the HA sector. This scenario is illustrated in the following example.

EXAMPLE 2: Two TOs and HAs choose P-strategies, and other parameters are as same as those in Example 1. If one TO with the P-strategy changes its strategy to R-strategy, then its profit drops from 0.046 to 0.034 if other TOs do not change their strategies. If one TO with R-strategy changes its strategy to P-strategy, then its profit drops from 0.396 to 0.167. Hence, no TO has any incentive to change its strategy. The same result could be derived for a HA in that the profit of this HA would drop from 2.185 to 1.333 if it changes its R-strategy to P-strategy. The profit would drop from 0.354 to 0.109 if it changed its P-strategy to R-strategy. Therefore, no TOs/HAs would want to change their current operation strategies. This indicates that the Nash Equilibrium exists in the TSC.

Although the equilibrium exists for a particular sector rather than a single enterprise, P strategy is supposed to be the best strategy choice. This is clear from Proposition 2 that the R-strategy enterprises are likely to maximize their revenues, reduce the market prices and unit profits through competition. Even if their profits are larger than that of the P-strategy enterprises, the extra income gained could not make up the losses made by the P-strategy enterprises, which result in a decrease in the total sector surplus. Additionally, proposition 3 shows the condition in which the supply chain warfare is maximized. It is easy to observe that the P-strategy is the optimal strategy for both TOs and HAs if the number of enterprises is sufficiently large (theoretically infinite).

CONCLUSION

This paper investigates strategy choices by enterprises in a TSC for package holidays. The TSC includes multiple TOs and HAs, and a TP. Two alternative strategies are available for the TOs and HAs to choose and they are the profit maximizing strategy and revenues maximizing strategy.

A two-stage game model is proposed to analyze the strategic choices of the enterprises in the TSC. The TP at the upstream of the TSC determines its admission price, while the HAs determine their operational strategies and the equilibrium price is reached through quantity competition. Given the price decisions from the upstream, TOs choose their strategies and select their optimal tourist quantities. The game has been solved by backward induction. The TOs first determine the optimal number of tourists they served according to their strategies. The prices derived from the TO sector are used by HAs and TP to make their decisions, respectively. Using the same logic for HAs , and combining the result from TP sector, the overall equilibriums are solved for the TSC.

Several managerial implications are derived from this theoretical research. Firstly, TOs and HAs that select the R-strategy achieve larger market shares and profits compared to the situation where the P-strategy is adopted. TP also prefers the R-strategy to the P-strategy in order to achieve a higher number of visitors. Secondly, if all TOs or HAs synchronously choose the same strategy, the P-strategy would be a better strategy for both sectors. Thirdly, when TOs or HAs can freely choose their strategies, there is a market equilibrium where the P-strategy and R-strategy could coexist. Finally, as far as individual sectors are concerned, one of the sectors, either the TO sector or the HA sector, is expected to adopt the P-strategy. In the context of entire supply chain, the condition in which the supply chain maximizes its welfare is also presented.

Further research can be extended in two possible directions. First, the quantity competition between TOs and HAs is assumed. An alternative model would be to replace the quantity competition by a price competition where the enterprises choose equilibrium prices rather than quantities. Comparative analysis could yield different and more interesting results. Second, strategy choices could be investigated in a more realistic market structure. For example, in reality, some sectors such as the TO sector and HA sector tend to dominate the markets and some players within each sector have significant influences as market leaders, while other sectors such as restaurants and retail shops depend somewhat on the leading sectors and small enterprises within a sector have to operate on the market as followers. Therefore, it would be interesting to examine the different impacts of strategy choices between industry leaders and followers in the TSCs.

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