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Price interactions between theme park and tour operator

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This paper conducts a theoretical investigation into pricing competition and coordination between Hong Kong Disneyland (HKD) and a tour operator. HKD supplies two types of admission ticket to the tour operator: an admission-only ticket and a package ticket that combines admission to the park and one night's accommodation in its hotels. The tour operator then sells these two types of admission ticket in the target market. A Stackelberg game model is proposed to formulate the leader–follower relationship, with HKD leading and the tour operator following. The equilibrium prices are derived by backward induction. The theoretical results show that HKD can coordinate with the tour operator through a quantity discount schedule. A Nash bargaining game suggests that HKD receives a larger share of the profit growth due to its dominant market power.

Keywords: Hong Kong Disneyland; tour operators; Stackelberg game; bargaining game; coordination

Hong Kong Disneyland (HKD) is the first world-class theme park in China and has been recognized as a key milestone in the development of the Hong Kong economy. Apart from providing a fantastic experience for visitors through four wondrous themes, the park also owns two themed hotels at the resort, which further enhance visitors' Disney experience. Since its opening in September 2005, HKD has attracted millions of visitors worldwide each year, especially those from mainland China. According to the report released by

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HKD, mainland visitors made up almost 40% of the attendance in 2007 and increased to about 50% in the first month of 2008.

Chinese tourists normally take package tours, as compared to Western tourists (Wong and Lau, 2001). Therefore, a large proportion of the visitors from mainland China travel to Hong Kong through package tours (Wang *et al*, 2000). The package tours sold by tour operators or their branches typically consist of a visit to HKD, one night's accommodation or more in Hong Kong and shopping experiences in such mega shopping malls as Times Square, Pacific Places and Harbor City.

Undoubtedly, tour operators have acted as agents in promoting HKD and its two hotels to the source markets. 'Our travel industry partners play an integral role in broadening our reach to . . . our overseas visitors with access to a wide range of packages that promote Hong Kong and Hong Kong Disneyland', said Roy Tan Hardy, HKD Vice President of Sales and Marketing (http://www.hongkongdisneyland.com/eng/discover/index.html). The park has increased contractual tour operators from 50 to 130 since its opening.

Although HKD and tour operators both benefit from the sale of the services provided by HKD, a variety of conflicts have arisen as each of them has their own interests. The conflicts evidently emerge from two major sources. First, due to consumer budget constraints, tour operators and HKD naturally compete directly for a share of the market (Medina-Muñoz *et al*, 2003). The success of one is seen ultimately as taking profit away from the other. Secondly, the room rates of themed hotels operated by HKD are much higher than those of other hotels with the same star rating. Therefore, the majority of tourists prefer the cheaper alternatives provided by tour operators that allow them to visit Disneyland and stay at other hotels. To achieve high room occupancy rates of its hotels, HKD requires tour operators to make every effort in promoting and selling its services rather than offering alternative, cheaper accommodation. Therefore, it is important that HKD develops a mechanism that aligns the objectives of the two parties and coordinates the tour operators' activities to optimize overall performance.

Our interest in the topic was sparked by this cooperation and conflict relationship between HKD and its channel partners (tour operators). We are interested in answering the following questions: How do HKD and tour operators design their pricing strategies? How can HKD influence the market demand for its products? Do HKD and tour operators have any incentive to coordinate their operations to achieve high profitability and, if so, how? How would HKD and tour operators divide the profit based on their bargaining powers?

Game theory is a powerful tool in studying cooperation and conflict between different players in business games (Owen, 1982). It has been recognized by researchers as a convenient analytical method that improves the comprehension of firms' interactions and their outcomes (Sinclair and Stabler, 1997). For example, Wie (2005) builds an N-person non-cooperative dynamic game to investigate the strategic capacity investment in the cruise industry. Wachsman (2006) presents a Nash game model to formulate strategic interactions among hotels and airlines. Pan (2006) proposes a Nash bargaining model to study the average daily rate per rented hotel room.

This paper proposes a Stackelberg game (sequential game) model to formulate the relationship between HKD and a tour operator. In this tourism system, only one tour operator is selected and considered for simplicity, but without loosing generality. The same principle could be extended easily to situations where multiple tour operators are involved. Both HKD and the tour operator are assumed to be profit maximizers. In this system, HKD is considered as the industry leader that dominates the market because all package holidays are assumed to include a tour to HKD. In this sequential game, HKD first specifies the prices of its services and the tour operator, as the follower, then decides the prices of the corresponding package tours. Equilibriums of the leader–follower game are solved through backward induction. The tour operator makes its move first to determine the optimal prices of package tours. Then, HKD learns the decisions of the tour operator and prices its services to maximize its profit.

The rest of the paper is organized as follows. The next section presents a Stackelberg game model and its equilibrium solutions. The subsequent section assesses the coordination between the two players through a quantity discount schedule offered by HKD to the tour operator. The paper concludes with some suggestions for further research.

The game model

Tourism utility

This section considers a simple scenario in which HKD sells its admission tickets through a tour operator. Two basic services are provided by HKD: park visit and hotel accommodation. Thus, HKD offers two types of tickets to the tour operator. One is an admission-only ticket to the park and the other is a combined package ticket that includes both park admission and accommodation. The tour operator then packages these two types of admission tickets with other services like shopping and sightseeing as package tours and sells the two corresponding package tours to tourists.

The first package tour includes a visit to the park, a one-night stay in one of the hotels operated by HKD and other tourism activities. It is reasonable to assume that the factors that affect tourists' choice of this package tour include the following. First, the HKD hotels are usually near the park, which is convenient for tourists who want to spend more time in the park. Second, the hotels are designed with the same or similar themes as the park and offer a different experience for tourists besides visiting the park. Third, the hotels provide additional services to park visitors, which can further enhance their recreational experiences. For example, HKD has designed many special activities and facilities in its hotels, such as storytelling and movie watching for children. Fourth, due to imperfect information, tourists tend to have more confidence in the HKD brand, even though other hotels may provide similar services. All these additional services and facilities incur costs and lead to a higher package price. Therefore, this package tour will only be suitable for those tourists who are more concerned about experience and are willing to pay a premium for such experience.

Alternatively, if tourists are price sensitive, they will choose the cheaper package tour, in which tourists can be accommodated in other hotels arranged by the tour operator with similar quality but low prices. Those hotels are normally located far away from the park and tourists have to spend additional time travelling to the park. Moreover, those hotels are independent of the park and are unlikely to provide any additional recreation experience, as compared with the Disneyland hotels.

For convenience of discussion, the package tour that includes both park admission and accommodation is denoted as a luxury package, while the one that excludes the HKD accommodation is denoted as an economy package.[1] The experience of tourists and the prices of the package tours are denoted s_i and p_i, respectively; $i = (L, E)$ where L stands for the luxury package tour and E stands for the economy package tour. It is reasonable to assume that $s_L > s_E$ and $p_L > p_E$. Moreover, we note $\Delta_S = s_L - s_E$, reflecting the difference in tourism experience with the two different package tours.

Different tourists have different preferences for the package tours offered by the tour operator. We represent this preference by θ. Parameter θ is a random variable following a uniform distribution normalized to [0,1] (Garcia and Tugores, 2006). A tourist's utility is defined as a function of both his or her perceived experience and the package cost: $u_i = v + \theta s_i - p_i, i \in \{L,E\}$, (Keane, 1997; Dumrongsiri *et al*, 2006). v is a basic utility of the package tour and is homogeneous among all tourists. If the utility is lower than zero, tourists will stay at home or join other forms of tourism, so they will not purchase any of the two package tours. Thus, if the tourists' preferences fall within $\theta \in [0,\hat{\theta}]$, the demand for either of the package tours would not be zero [where $\hat{\theta} = (p_E - v/s_E)$]. A tourist will be indifferent between the luxury and the economy package tours if and only if $u_L = u_E$ or when $\theta^* = (p_L - p_E)/(s_L - s_E)$. To sum up, the demand function for the luxury package tour is

$$D_L = 1 - \theta^* = 1 - \frac{p_L}{\Delta_S} + \frac{p_E}{\Delta_S} \tag{1}$$

while the demand function for the economy package tour is

$$D_E = \theta^* - \hat{\theta} = \frac{v}{s_E} + \frac{p_L}{\Delta_S} - (\frac{1}{\Delta_S} + \frac{1}{s_E})p_E \tag{2}$$

Stackelberg equilibrium

This section considers an unbalanced tourism market in which HKD leads the package holiday market over the tour operator. The market structure is especially valid for the park industry in mainland China where no true world-class amusement parks exist except for HKD. With many exciting rides and operated by the world famous corporation, HKD is extremely attractive to Chinese tourists. Compared with HKD, tour operators normally face fierce competition from a large number of competitors operating in mainland China. A single tour operator could hardly influence the total volume of tourists. In such a circumstance, a leader–follower relationship as a sequential game is valid, where HKD is a leader making its first move and the tour operator as a follower makes its move in response to the action taken by HKD.

The strategic moves or decision variables of HKD include the wholesale prices of the combined and the admission-only tickets: w_L and w_E. Let c and c_{TH} be the unit costs of the park and its hotels, respectively. The profit of HKD is

$$\pi_{TP}(w_L,w_E) = D_L(w_L - c_{TH} - c) + D_E(w_E - c) \tag{3}$$

The decision variables for the tour operator consist of the prices of the luxury and the economy package tours: p_L and p_E. Because the accommodation of the economy package tour is arranged with an external hotel, the unit cost is, therefore, c_{EH}. In order to keep the model simple, we further assume the unit operational cost of the tour operator is zero because it is a constant and disappears when deriving differentials in the equation. The conclusions of this paper, nonetheless, still hold if non-zero unit operational cost is considered in the analysis. Consequently, the profit of the tour operator is

$$\pi_{TO}(p_L,p_E) = D_L(p_L - w_L) + D_E(p_E - w_E - c_{EH}) \tag{4}$$

The game is solved by backward induction. For the tour operator, the problem is to determine the optimal prices of the luxury and the economy package tours in order to maximize its profit.

$$Max\ \pi_{TO}(p_L,p_E) = D_L(p_L - w_L) + D_E(p_E - w_E - c_{EH}) \tag{5}$$

The following proposition shows the optimal decisions of the tour operator.

Proposition 1. Given the prices offered by HKD, w_L and w_E, the tour operator's profit is joint concave in p_L and p_E. The optimal prices of the tour operator are

$$p_L = \frac{v + w_L + s_L}{2}\ ,\ p_E = \frac{v + w_E + s_E + c_{EH}}{2}\ . \tag{6}$$

Proof. The Hessian matrix of π_{TO} is a negative definite because

$$\frac{\partial^2 \pi_{TO}}{\partial p_L^2} = -\frac{2}{\Delta_S} < 0\ ,$$

$$\frac{\partial^2 \pi_{TO}}{\partial p_E^2} = -2\left(\frac{1}{\Delta_S} + \frac{1}{s_E}\right) < 0 \text{ and}$$

$$\frac{\partial^2 \pi_{TO}}{\partial p_L^2}\frac{\partial^2 \pi_{TO}}{\partial p_E^2} - \left(\frac{\partial^2 \pi_{TO}}{\partial p_L \partial p_E}\right)^2 = \frac{4}{s_E \Delta_S} > 0\ .$$

Take the first derivations of π_{TO} respective to p_L and p_E and combine the two equations

$$\frac{\partial \pi_{TO}}{\partial p_L} = 0$$

and

$$\frac{\partial \pi_{TO}}{\partial p_E} = 0 \ ,$$

the result could be achieved.■

The result is very intuitive. The prices of the package tours are related positively to the utilities, the experience and the cost variables. Substituting these prices back into Equation (3) yields the following optimization problem for HKD:

$$Max \ \pi_{TP}(w_L, w_E) = \frac{(w_E - w_L + \Delta_S + c_{EH})(w_L - c_{TH} - c)}{2\Delta_S} +$$

$$(\frac{v - w_E - s_E - c_{EH}}{2S_E} + \frac{w_L - w_E + \Delta_S - c_{EH}}{2\Delta_S})(w_E - c) \quad (7)$$

Solving Equation (7) for w_L and w_E, and substituting them into Equation (6), we have a unique equilibrium shown in the following proposition.

Proposition 2. The Stackelberg equilibrium $(w_L^*, w_E^*, p_L^*, p_E^*)$ is as follows:

$$w_L^* = \frac{v + s_L + c_{TH} + c}{2} \ , \ w_E^* = \frac{v + s_E - c_{EH} + c}{2} \ . \quad (8)$$

$$p_L^* = \frac{3v + 3s_L + c_{TH} + c}{4} \ , \ p_E^* = \frac{3v + 3s_E + c_{EH} + c}{4} \ . \quad (9)$$

The equilibrium profits of HKD and the tour operator are, respectively

$$\pi_{TP}^* = 2\pi_{TO}^* = \frac{(v + s_E - c_{EH} - c)^2}{8s_E} + \frac{(\Delta_S - \Delta_C)^2}{8\Delta_S}, \text{ where } \Delta_C = c_{TH} - c_{EH} \ . \quad (10)$$

The market demands for the two package tours and the total demand are given as

$$D_L^* = \frac{1}{4} - \frac{\Delta_C}{4\Delta_S} \ , \ D_E^* = \frac{\Delta_C}{4\Delta_S} + \frac{v - c_{EH} - c}{4s_E} \ , \ D_{Total}^* = \frac{v + s_E - c_{EH} - c}{4s_E} \ . \quad (11)$$

In order for $D_L^* > 0$, it is necessary that $\Delta_S > \Delta_C$. The proof of Proposition 2 is similar to that of Proposition 1, thus omitted.

The equilibrium is a set of pricing strategies in which both players have no incentive to change their prices unilaterally. The proposition shows that the basic utility and the experience variables have positive impact on the equilibrium prices. The price of the admission-only ticket decreases when the price of the external hotel rises because of the complementary effect. As seen in Equation (10), HKD gains twice as much profit as that of the tour operator due to its dominant position. Most importantly, the profit functions of the two parties are similar, implying that their interests are consistent and are influenced by the same factors. Equations (10) and (11) show that the total volume of the package tours influences the profits of HKD and the tour operator directly. As a result, they are motivated to cooperate in order to increase the basic utility of tourists, reduce the unit operational cost of the park, press the external hotels to reduce their prices and make the prices of the hotels of HKD more competitive.

In practice, however, HKD does not necessarily know in advance exactly how many tourists will book into its hotels. Given the fixed room numbers, it is profitable for HKD to maximize the occupancy rate of its hotels. Therefore, HKD requires tour operators to sell more luxury package tours to tourists. But the tour operators often find it hard to finish the contractual tasks set by HKD, due to insufficient market demand for the luxury package tour. In order to increase the market demand for the luxury package tour, an implication, based on Equation (11), is that HKD needs to enhance tourists' experience in its hotels through improving service quality, offering unique services and reducing the unit operation cost of its hotels relative to that of the external hotels.

Coordination

Both HKD and the tour operator are self-interested and autonomous entities that are concerned primarily with optimizing their own objectives. Therefore, the actions taken by each individual player may not lead to superior performance of the whole supply chain. For example, HKD would like to raise the ticket prices in order to gain more profit. However, increased ticket prices actually lead to high operational costs for the tour operator, who has to increase the prices of the package tours in order to maintain its revenue income. The increase in package tour prices prevents some tourists from purchasing their products. Consequently, the market demand for both HKD and the tour operator is reduced.

Therefore, it is important for HKD to develop a pricing mechanism which simultaneously can achieve two objectives: first, both HKD and the tour operator achieve better pay-offs; and second, the total welfare (profit) of this tourism system is maximized. If both objectives are accomplished, we say that HKD and the tour operator *coordinate* fully with each other.

Coordination through integration

One extreme supply chain coordination strategy is that all enterprises are integrated as a single decision-making body that shares the same objective function and seeks a global optimization. When HKD and the tour operator are integrated, the following formula shows the total profit with respect to the two prices of the package tours:

$$Max\ \pi_{IN}(p_L,p_E) = D_L(p_L - c_{TH} - c) + D_E(p_E - c_{EH} - c) \quad (12)$$

Proposition 3 presents the optimal solution of the integrated system.

Proposition 3. The profit for the integrated system π_{IN} is joint concave in p_L and p_E. The optimal prices, p_L^{IN} and p_E^{IN}, are, respectively, defined as

$$p_L^{IN} = \frac{v + s_L + c_{TH} + c}{2}, \quad p_E^{IN} = \frac{v + s_E + c_{EH} + c}{2}. \tag{13}$$

The market demands for the two package tours and total demand are, respectively

$$D_L^{IN} = \frac{\Delta_S - \Delta_C}{2\Delta_S}, \quad D_E^{IN} = \frac{\Delta_C}{2\Delta_S} + \frac{v - c_{EH} - c}{2s_E}, \quad D_{Total}^{IN} = \frac{v + s_E - c_{EH} - c}{2s_E}. \tag{14}$$

The optimal total profit for the whole system is

$$\pi_{IN}^* = \frac{(\Delta_S - \Delta_C)^2}{4\Delta_S} + \frac{(v + s_E - c_{EH} - c)^2}{4s_E}. \tag{15}$$

The proof of Proposition 3 is similar to that of Proposition 1, thus omitted. In the Stackelberg game model, HKD and the tour operator are competitive and make their pricing decision independently. The total profit for the disintegrated system π^* is defined as

$$\pi^* = \pi_{TP}^*(w_L^*, w_E^*) + \pi_{TO}^*(p_L^*, p_E^*). \tag{16}$$

The following proposition summarizes the relationship between the integrated and leader–follower systems.

Proposition 4. (i) $\Delta\pi = \pi_{IN}^* - \pi^* = \pi_{TO}^* > 0$; (ii) $p_L^* > p_L^{IN}$ and $p_E^* > p_E^{IN}$; (iii) $D_L^{IN} > D_L^*$, $D_E^{IN} > D_E^*$, $D_{Total}^{IN} > D_{Total}^*$; (iv) $\Delta\pi$ increases with Δ_S.

Proposition 4 suggests that the integrated system is more efficient than the disintegrated one as the total profit of HKD and the tour operator is higher in the integrated system than that in the disintegrated system. The potential profit increase through integration provides an incentive for HKD to form a collaborative partnership with the tour operator. This collaboration will result in an increase in the demand for both luxury and economy package tours. The lower prices offered by the tour operator in the integrated system will attract more tourists to purchase the package tours. We also notice that the performance of the disintegrated system is far from the optimal system solution due to the increasing difference of tourists' experience. Therefore, coordination is very important for both HKD and the tour operator.

Coordination through quantity discount

Quantity discount, as a traditional market strategy in practice, stems from the fact that product/service supplier discount offers can influence buyers' purchasing behaviour by providing economic incentives (Shin and Benton, 2007). This strategy is popular with tourism product/service suppliers in the tourism industry (Campo and Yagüe, 2007).

In the following analysis, we focus on HKD's quantity discount strategy and examine whether this strategy could provide beneficial coordination between the two players. Proposition 5 shows the results of our game model.

Proposition 5. HKD can coordinate the tour operator by offering a quantity discount with the following unit prices

$$w_L = \beta v + (1 - \beta)(c_{TH} + c) + \beta s_L(1 - q_L) - \beta s_E q_E \tag{17}$$

$$w_E = \beta(v - c_H) + (1 - \beta)c + \beta s_E(1 - q_L - q_E) \tag{18}$$

where q_L and q_E are quantities demanded for the two packages and $\beta \in [0,1]$.

Proof. For the tour operator, the total number of package tours sold equals the market demand for its product. Substituting q_L and q_E by D_L and D_E, we have

$$w_L = \beta p_L + (1 - \beta)c_{TH} + (1 - \beta)c, \quad w_E = \beta p_E - \beta c_{EH} + (1 - \beta)c.$$

Thus, the tour operator maximizes its profit, given the prices of the two products offered by HKD. That is $Max\ \pi_{TO}(p_L,p_E) = (1 - \beta)\pi_{IN}$. The objective of the tour operator is the same as that of the integrated system. Therefore, they have the same solution.■

This result suggests that HKD could coordinate the tour operator through a quantity discount schedule. Under this schedule, the tour operator will take the market prices of the package tours in the integrated system as its own prices. As a result of this coordination, the profits of HKD and the tour operator are $\beta\pi^*_{IN}$ and $(1 - \beta)\pi^*_{IN}$, respectively. Therefore, the parameter, β, represents the profit share of HKD within the integrated system.

In fact, HKD has been using the quantity discount price strategy to encourage tour operators to sell more HKD packages. Meanwhile, HKD has also imposed many restrictions on the implementation of the pricing strategy from its opening. For example, in order to ensure the occupancy rate of its hotels, HKD had requested the tour operators who wanted to take the quantity discount of the admission-only package to sell at least a certain percentage of the combined package. If the tour operators want to sell just the admission-only ticket, they will not receive any quantity discount. This restriction works well for some market segments and the proportion of the combined package could be determined easily based on Equation (11), that is

$$\eta = \frac{D_L^{IN}}{D_E^{IN}}.$$

However, for some market segments, especially for tourists from less developed areas, the cost of the package tour is still the dominant factor that affects their purchasing decisions. For such market segments, the experience gained from staying in the HKD hotels does not compensate the negative effect of the price increase, that is

$$\Delta_S \leq p_L^{IN} - p_E^{IN} = \frac{\Delta_S + \Delta_C}{2}.$$

Therefore,

$$D_L^{IN} = \frac{\Delta_S + \Delta_C}{2\Delta_S} < 0$$

and this implies that the demand for the luxury package tours will be zero. In realizing this limitation, HKD subsequently dropped this practice.

In the Stackelberg game, the equilibrium profits of HKD and the tour operator are π^*_{TP} and π^*_{TO}. If the quantity discount is accepted by both players, it must first satisfy $\beta\pi^*_{IN} \geq \pi^*_{TP}$ and $(1 - \beta)\pi^*_{IN} \geq \pi^*_{TP}$. Thus, we have

$$\frac{1}{2} = \frac{\pi^*_{TP}}{\pi^*_{IN}} \leq \beta \leq 1 - \frac{\pi^*_{TO}}{\pi^*_{IN}} = \frac{3}{4} .$$

This suggests that HKD will take about three-quarters of the increased profit, while the tour operator will have a cut of less than one half of the increased profit.

Nash bargaining result

In order to determine the profit share of HKD, β, in the quantity discount schedule, we follow the standard Nash bargaining model (Nash, 1950). HKD and the tour operator's preferences for the shares of the system profit increase are defined as $\Delta\pi_{TP}$ and $\Delta\pi_{TO}$, where $\Delta\pi_{TP} + \Delta\pi_{TO} = \Delta\pi$. These preferences are represented by the utility functions $u_{TP}(\Delta\pi_{TP})$ and $u_{TO}(\Delta\pi_{TO})$. In the bargaining model, HKD and the tour operator are assumed to maximize the following objective function jointly:

$$Max\ [u_{TP}(\Delta\pi_{TP})]^{\alpha}[u_{TP}(\Delta\pi_{TP})]^{\beta} \tag{19}$$
$$\text{st.} \quad \Delta\pi_{TP} + \Delta\pi_{TO} = \pi^*_{IN} - (\pi_{TP} + \pi_{TO})$$

where α and β denote the bargaining power. Like Pan (2006), we assume that a player's utility is equal to its objective, as the utilities of HKD and the tour operator are the final profit shares after bargaining. Thus, Equation (19) is rewritten as

$$Max\ (\Delta\pi_{TP})^{a}(\Delta\pi_{TO})]^{b} \tag{20}$$
$$\text{st.} \quad \Delta\pi_{TP} + \Delta\pi_{TO} = \pi^*_{IN} - (\pi_{TP} + \pi_{TO})$$

Solving the above model for $\Delta\pi_{TP}$ and $\Delta\pi_{TO}$ yields the bargaining result, which is given in Proposition 6.

Proposition 6. The profit share of HKD, β, in the quantity discount schedule obtained by Nash bargaining is

$$\beta = \frac{3}{4} - \frac{a}{4(a + b)} .$$

HKD and the tour operator split the increased system profit according to

$$\frac{a}{(a+b)}\Delta\pi \text{ and } \frac{b}{(a+b)}\Delta\pi.$$

This proposition illustrates that if HKD and the tour operator have the same degree of bargaining power, they should share the system profit gains equally, that is, $\Delta\pi/2$, and the parameter β in the quantity discount schedule is $\beta = 5/8$. However, in our analysis, HKD as a core attraction for tourists is assumed to have a dominant power over the tour operator. Therefore, the bargaining power of HKD is higher than that of the tour operator. This suggests that HKD will receive a higher share of the system profit growth, as is shown in the proposition when $a > b$.

With the fast growth in the tourism industry in mainland China, tour operators are playing an ever-increasing role in facilitating the demand for international travel by Chinese residents. More and more Chinese tourists are now taking their holidays through package tours. In the first year, HKD missed its attendance target of 5.6 million by 400,000. As a result, HKD lost about HK$363 million in sale revenue. This enables the tour operator to increase its bargaining power over HKD. According to Proposition 6, the increase in the tour operator's bargaining power will increase its profit shares and the higher quantity discount when negotiating with HKD. That explains why HKD has increased the quantity discount twice in June and July 2006, respectively.

Concluding remarks

This paper investigates the competition and coordination between HKD and a tour operator using game theory. HKD sells both admission-only and combined tickets to the tour operator. The latter then packages the products of HKD with other activities and sells the two package tours to the target markets. In the leader–follower relationship, HKD dominates the market.

A sequential Stackelberg game model is developed to explain the interaction between HKD and the tour operator. As a leader, HKD first determines the prices of the two tickets that are offered to the tour operator. The tour operator, as a follower, then decides the market prices of its package tours, which are sold to tourists. The game has been solved by the backward induction approach. The equilibrium solution implies that HKD is likely to make an effort to attract more tourists to purchase the luxury package tour through enhancing tourists' experience in its hotels and reducing the unit operation costs of its hotels.

The paper also looks at the players' decisions on the pricing of their products through coordination. Our finding is that a quantity discount schedule can achieve the system coordination that maximizes the two players' profits. The bargaining result shows that HKD receives a larger share of the system profit growth than the tour operator. But with an increased bargaining power, the tour operator's share of the system profit also increases.

There are two main directions in which further research could be extended. First, our model is deterministic, which assumes that the market demand is only affected by the price of the package tours. However, in practice the demand can also be affected by other stochastic factors, such as seasonality, economic condition and even epidemics such as bird flu and SARS. It would be interesting to discuss the impact of such factors on pricing decisions by stochastic game models. Secondly, this is a theoretical study in the context of HKD and it would be desirable if some empirical analyses could be carried out to confirm the theoretical models developed in this paper.

Endnotes

1. For example, the China Youth Travel Service (CYTS, http://www.aoyou.com/), one of the biggest travel agencies in mainland China, supplies two kinds of Hong Kong package tours to mainland Chinese tourists. Both packages include a visit to HKD and three night's accommodation. The first package tour is known as the 'Basic HKD Tour', in which tourists stay at a medium-tariff hotel for three nights. The second one is called the 'Premium HKD Tour', in which tourists stay at the Disney Hollywood Hotel (a high-tariff hotel) for one night and in a same tariff hotel that does not belong to HKD for another two nights.

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