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Online distribution of airline tickets: Should airlines adopt a single or a multi-channel approach?

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ABSTRACT

In today's digital world, airlines typically distribute tickets both via their own websites and through online travel agency (OTA) platforms such as Expedia and Travelocity. Although associated with higher distribution costs, selling tickets through the platforms offers airlines exposure to a broader consumer base, and potentially higher sales than selling tickets solely through their own websites. While most airlines have adopted a multi-channel approach by selling tickets through OTA platforms and their websites, some (e.g., Southwest Airlines, easyJet and Ryanair) sell only via the latter. Is one approach better than the other, and if so, under what circumstances? This study analyzes factors that affect an airline's distribution strategy by developing a decision support model. We find that airlines are less likely to use OTA platforms if they have a large loyal consumer base or if the OTA platform is highly competitive.

1. Introduction

Faced with high fixed costs, airlines continually strive to find an efficient and effective distribution strategy that achieves revenue maximization for each seat on every flight (Toh & Raven, 2003). Until the late 1990s, airlines sold the majority of their tickets through brick-and-mortar travel agencies, which served as the interface between airlines and the public (Pötzl, 2000). Distribution through these agencies was expensive—not only did it require airlines to pay commissions to the travel agencies but also transaction fees for the computerised reservation systems that facilitated the transactions (Bilotkach & Pejcinovska, 2007). The rise of the Internet as an information and booking channel in the late 1990s offered airlines the opportunity to disintermediate travel agents and sell directly to the public (Buhalis & O'Connor, 2006). As Internet sales grew, most airlines first reduced and then eliminated brick-and-mortar travel agents, concentrating their marketing on driving consumers towards self-service on Internet-based channels (Werthner & Klein, 1999). While the role of traditional brick-and-mortar travel agencies remains significant in specialized markets such as group tours and complex international itineraries, direct online transactions continue to increase and thus reduce distribution costs and increase airlines' profits (Doane, Hendricks, & McAfee, 2003).

The rapid development of the Internet also triggered another trend—the development of major online travel agencies (OTAs) such as Expedia, Travelocity, and Orbitz (Venkateshwara & Smith, 2006). OTAs act as global portals providing one-stop travel-shopping facilities to consumers, allowing them to gather information about, and book, all their travel needs on a single site (McIvor, O'Reilly, & Ponsonby, 2003). These distribution channels, to which we refer as OTA platforms, quickly became popular worldwide and attracted a significant portion of today's online travel transactions. For example, an estimated 15% of the US$40 billion air travel market in the United States flows through OTAs (Offutt, 2007), with an even higher percentage in Europe and Asia where the overall online travel market is growing rapidly (Burka et al., 2008).

Airlines currently face a strategic choice. Working with platforms offers airlines a broader consumer base than if they distributed solely through their brand.com websites (O'Connor, 1999). However, selling through these platforms is more costly as a result of the segment fees or commissions paid to point-of-sale agents for each transaction, and various other fees to technology providers such as the global distribution system (GDS) for facilitating reservation processing, which also exposes them to fierce competition on the same platform (Piga & Filippi, 2002). Selling solely through the airline's website, on the other hand, saves airlines distribution cost and attenuates competitive pressure, but comes at the price of a limited reach to potential customers (Venkateshwara & Smith, 2006).

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While most airlines sell their tickets through both OTAs and their own websites, a few have adopted a single-channel distribution strategy of selling tickets solely via the airline's website. Such a strategy appears to be highly successful. For example, JetBlue and Southwest Airlines sell up to 90% of their tickets directly through their own websites (Orlov, 2006); similar trends are reported for some European carriers such as Ryanair and easyJet (PhoCusWright Inc., 2008). While this direct sales strategy is appealing on the cost side, it may limit the airline's ability to expand its consumer base. Indeed, some anecdotal evidence has shown that deciding not to use OTA platforms may have contributed to the bankruptcy of some airlines (Alamdari & Mason, 2006).

Given the critical role of OTA platforms in selling travel products, it is surprising that certain airlines consistently perform well even though they sell tickets solely via their own websites. For example, the European carrier Ryanair is one of the most successful and profitable airlines in the world, even though it doesn't use OTAs.

The objective of this study is to analyze some of the factors that have prompted several airlines to adopt a single-channel approach to ticket distribution. By modeling an airline's optimal decision on distribution channels, this study examines the conditions that justify some airlines' choice of a distribution strategy. Numerical analysis shows the importance of competitive pressure on OTA platforms and loyal consumers' responsiveness to price change in explaining airlines' choice of distribution strategy.

This paper is organized as follows. Section 2 describes a conceptual model that shows how an airline's profit depends on its distribution channel(s). The single-channel distribution (the company website) and dual-channel distribution (an OTA platform plus the company's brand.com website) strategies are then compared in Section 3. Since the optimal price on the OTA channel critically depends on market structure, we derive a threshold price that equates profits under both strategies without assuming a specific market structure. In Section 4, the optimal price under a single-channel distribution and the threshold price under a dual-channel distribution are derived numerically by assuming a uniform distribution of consumer reservation prices. Conclusions, limitations and implications of the study are discussed in the final section.

2. The model

We assume a total of N consumers are interested in buying a particular airline's tickets online, and we normalize $N = 1$ for simplicity. Consumers are heterogeneous and their reservation prices—the maximum price they are willing to pay—follow a cumulative distribution $F(r)$, where r is the consumers' reservation price for a ticket. Consumers who visit a website (either an individual airline's website or an OTA platform) compare the offered price (p) with their reservation price (r), and purchase a ticket from the website if $p \le r$.

The market equilibrium depends on the assumption of consumers' search pattern for tickets. Two types of search patterns are predominantly considered in the literature: fixed-sample search vs. sequential search. In a fixed-sample search, consumers observe multiple prices before selecting the lowest price option (Burdett & Judd, 1983; Janssen & Moraga-Gonzalez, 2004; Varian, 1980). In a sequential search, consumers draw one observation at a time and make a decision by comparing the marginal benefits of accepting the observation with the search cost of continuing the search (Diamond, 1971; Stahl, 1989). Based on empirical observations and for mathematical tractability, this study adopts the sequential search process in which consumers make a purchase decision by comparing an offered price with the price they are willing to pay. In a survey of online travelers, for example, Brunger and Perelli (2009) find that most travelers use very simple single or two-step searches before booking, even though they are aware that more possibilities exist.

Airlines, like many other vendors, are typically faced with two types of consumers: loyal consumers who consistently purchase tickets from a particular airline and non-loyal consumers who have no preference for a specific airline and make their choices based on fares, destinations and time factors. Loyal consumers could be monetarily locked in to a specific airline to collect mileage and other fringe benefits, or cognitively locked-in because their past experience with an airline reduces its search cost (Johnson, Bellman, & Lohse, 2003). Non-loyal consumers first visit OTA platforms, which aggregate airfare information from various airlines (Smith & Rupp, 2004).

Loyalty to a specific airline emerges from complex interactions between the airline and consumers, and depends on various elements established over time. To focus on the airline's ticket distribution strategy, this study assumes that loyalty is inversely related to the price; the higher the price, the less likely consumers will develop loyalty. Let $\theta(p)$ denote the share of loyal consumers of an airline, where $\theta'(p) \le 0$. The share is assumed to be bounded by upper and lower bounds: $0 \le \underline{\theta} \le \theta(p) \le \overline{\theta} \le 1$. The lower bound $\underline{\theta}$ is reached when the airline sets a monopoly price for its loyal consumers, and the upper bound $\overline{\theta}$ is achieved when the airline sets its price at the marginal cost level.

An airline's decision on whether to distribute tickets through its brand.com website or through an OTA platform depends on the profits from these channels. For expositional simplicity, we assume that only a single OTA platform operates in the market and n different airlines are competing on that platform. Even if two itineraries are not identical (e.g., same itinerary with different airline names through code-sharing), we assume consumers perceive them as perfect substitutes. Since consumers who search on the OTA platform are brand-neutral, all airlines on the platform charge the same price for the same itinerary and the platform market is evenly shared among all participant airlines.

The demand for tickets from an airline's brand.com website (subscript A for airline) and from the OTA platform (subscript O) at price p are, respectively,

$$Q_A = \theta(p)[1 - F(p)]$$

and

$$Q_O = [1 - \theta(p)][1 - F(p)]/n.$$

The distribution cost of selling a ticket through an airline's website is normalized to zero and the additional distribution cost of selling a ticket through an OTA platform is assumed constant at c. By selling tickets through a platform, the airline can reach an additional group of non-loyal consumers, $(1 - \theta(p))$, while incurring additional distribution cost c. The profits from selling tickets through each channel are, respectively,

$$\pi_A = pQ_A = p\theta(p)[1 - F(p)]$$

and

$$\pi_O = (p - c)Q_O = (p - c)[1 - \theta(p)][1 - F(p)]/n.$$

3. Optimal choice of distribution channel

Airlines commonly adopt two distribution strategies: they either sell tickets only via their brand.com website (called "single-channel distribution strategy") or they use their brand.com website and an OTA platform website (called "dual-channel distribution strategy''). Under a single-channel distribution strategy, an airline may charge a price as high as the monopoly price to its loyal consumers who visit the brand.com website. Under a dual-channel distribution strategy, the airline faces competition with other providers on the same platform and has to reduce the airfare available to its loyal consumers in its brand.com website if the price discrimination between the two channels is infeasible.[1] This section examines the prices and corresponding airline profits for these two strategies, and analyzes the effect on the threshold price of the number of airlines on a platform.

3.1. Single-channel distribution strategy

We first consider a case where an airline sells tickets solely via its brand.com website. Consumers who visit the airline's website purchase tickets as long as the price offered is less than their reservation prices. While the airline holds a certain degree of monopoly power over these consumers, it is faced with implicit competition from other airlines: too high a price discourages consumers from visiting its website and thus the share of loyal consumers $\theta(p)$ decreases. The airline's profit maximization problem under a single-channel distribution strategy is:

$$\max_p \pi_A = p\theta(p)[1 - F(p)]. \tag{1}$$

The first order condition is:

$$\frac{\partial \pi_A}{\partial p} = \theta(p)[1 - F(p)] + p\theta'(p)[1 - F(p)] - p\theta(p)F'(p) = 0.$$

This condition can be rewritten as:

$$p = \frac{\varepsilon(p) + 1}{\lambda(p)}, \tag{2}$$

where $\varepsilon \equiv \theta'(p)(p/\theta(p))$ is the elasticity of the share of loyal consumers with respect to price and $\lambda(p) = F'(p)/[1 - F(p)]$ is the hazard rate of price change. π_A^* denotes the optimal profit under the single-channel optimal price p_A^*, which solves equation (2). The elasticity ε is non-positive because $\theta'(p) \le 0$, and is larger than -1 for a positive p_A, i.e., $-1 < \varepsilon \le 0$. The larger the elasticity (in terms of the absolute value), the less likely consumers are to stick to the airline's website and consequently the lower the price the airline can charge. The hazard rate $\lambda(p)$ specifies the instantaneous purchase rate at the price distribution $F(p)$, given that consumers have not purchased the ticket at a price lower than p. The optimal price under a single-channel distribution strategy is determined by balancing the elasticity of the share of loyal consumers and the hazard rate of the price change.

If the share of loyal consumers is independent of the price (i.e., $\theta'(p) = 0$ or $\varepsilon = 0$), as is often assumed in many studies (e.g., Baye & Morgan, 2001), the airline can exercise full monopoly power over its loyal consumers and the optimal price can be derived from the following condition:

$$p_A^* = \frac{1}{\lambda(p_A^*)}. \tag{2'}$$

If we assume a non-decreasing hazard rate, which is satisfied by many distributions (e.g., uniform, exponential, logistic), the single-channel equilibrium price under an endogenous share of loyal consumers is less than the monopoly price level derived from equation (2′). The exact level of equilibrium price depends on the loyal consumers' response to price ε and the distribution of consumers' reservation price $F(p)$.

3.2. Dual-channel distribution strategy

Many airlines use both their brand.com websites and OTA platforms to sell their tickets online. The advantage of selling tickets through an OTA platform stems from its access to broader consumer base. However, an airline that joins an OTA platform also incurs an additional distribution cost and is exposed to competitive pressures from other airlines selling through the same platform. We restrict our analysis to the case where price discrimination between the two distribution channels is neither possible nor allowed.

The derivation of the optimal equilibrium price under dual-channel distribution depends on the specification of market structures on the OTA platform (Baye & Morgan, 2001). Rather than deriving an equilibrium price under a specific market structure on the platform, we analyze the threshold price that discourages an airline from joining the platform. This approach enables us to examine the factors that affect an airline's decision in a more general market environment.

An airline's profit under a dual-channel distribution strategy is (subscript D stands for dual-channel distribution):

$$\pi_D = p\theta(p)[1 - F(p)] + (p - c)[1 - \theta(p)][1 - F(p)]/n. \tag{3}$$

The first term on the right hand side (RHS) of equation (3) is the airline's profit from its brand.com website, and the second term is the profit from the OTA platform in which the profit is equally divided among n participating airlines. By adopting a dual-channel strategy, the airline gains expanded demand and additional profit by selling through the platform (the second term), which may compensate for the possible reduction of profit from its own website (the first term). An airline chooses to sell tickets through its website and an OTA platform, if π_D is larger than π_A^*.

Let p_T denote the threshold price that solves $\pi_D = \pi_A^*$. If the market price on the platform is p_T, the airline is indifferent to joining the platform and selling solely through its own website. If the threshold price is smaller than the optimal price under single-channel distribution ($p_T \le p_A^*$), an airline can make more profit under dual-channel distribution by reducing the price below p_A^*, thus the dual-channel strategy can be optimal. If $p_T > p_A^*$, on the other hand, the choice is ambiguous as it depends on the shape of the profit functions. If the dual-channel profit level below p_T is lower than the single-channel profit at that price, the single-channel distribution strategy is likely to be chosen because the same level of profit can be achieved with a lower price. If the dual-channel profit level below p_T is higher than the single-channel profit, the dual-channel distribution strategy can be better for any price below p_T.

The exact decision strategy depends on the distribution function of consumers' reservation price $F(p)$, the pattern of loyal consumers' response to price $\theta(p)$ and the number of competitors on the platform n, as well as the parameter values of each function. Though it is difficult to analyze the threshold price without assuming specific functional forms of the distribution $F(p)$ and consumers' response $\theta(p)$, we can analyze the competitive market effect on the threshold price in a general setting.

3.3. Effect of the number of competitors on threshold price

Next we analyze how the number of competitors on the OTA platform affects the threshold price under the dual-channel

[1] The clause of no price discrimination between the brand.com and OTA platforms is usually an enforceable part of the contract between the airline and the platform.

distribution strategy. Total differentiation of $\pi_D = \pi_A(p_A^*)$ with respect to the threshold price and the number of competitors leads to:

$$\frac{\mathrm{d}p_T}{\mathrm{d}n} = \frac{(p-c)[1-\theta(p)]/n}{[(n-1)\theta(p)+1][1-\lambda(p)p]+\lambda(p)c[1-\theta(p)]+[(n-1)\theta(p)+c]\theta'(p)}. \tag{4}$$

Since the numerator on the right side of equation (4) is non-negative (assuming that the distribution cost is less than the price), the sign of equation (4) depends on the sign of the denominator. While both the first and second terms of the denominator are positive because the threshold price is bounded from above by $1/\lambda(p)$ (i.e., $\lambda(p)p < 1$), the sign of the third term is non-positive because $\theta'(p) \le 0$. Thus, the sign of equation (4) depends on the relative size of each term in the denominator.

If the share of loyal consumers is independent of the price so that $\theta'(p) = 0$, the third term is zero and the sign of equation (4) is always positive. For the general case where the share of loyal consumers is a function of price, the third term is negative and the sign is indeterminate. If loyal consumers can easily switch websites for a small change in price or the number of competitors on the platform n is large, the size of the third term can dominate the first two terms and the sign of equation (4) is likely to be negative. An increase in price due to an additional number of competitors decreases an airline's profit from its website more so than its profit from the platform.

4. Optimal distribution strategy: numerical analysis

The optimal price p_A^* under a single-channel distribution strategy (equation (2)) and the threshold price p_T under a dual-channel distribution strategy (equation (3)) cannot be explicitly derived without assuming the functional forms of $\theta(p)$ and $F(p)$. We can consider a few functional forms of the loyal consumer's share and the distribution of consumers' valuations. Potential forms for the former include the linear function, $\theta(p) = \alpha - \beta p$, or the constant elasticity function, $\theta(p) = \alpha p^{-\varepsilon}$, while the latter can take the uniform or exponential distribution. Combinations of these functional forms yield qualitatively similar results; in what follows we limit our attention to the case in which the loyal consumers' share takes the linear function and the valuations follow a uniform distribution over [0, u], where u is the maximum level of consumers' reservation price.

4.1. Price levels under alternative distribution channels

The optimal price under a single-channel distribution channels can be derived from equation (2) as

$$p_A^* = \frac{(\alpha+\beta u) - \sqrt{\alpha^2 - \alpha\beta u + \beta^2 u^2}}{3\beta}.$$

If the share of loyal consumers is independent of the price ($\varepsilon = 0$), the optimal price reaches the monopoly price level, $p_A^* = u/2$. We can further express loyal consumers' share function $\theta(p)$ as a function of its boundary values. Since the upper bound $\overline{\theta}$ is obtained when the price equals the zero marginal cost, $\alpha = \overline{\theta}$. On the other hand, the lower bound $\underline{\theta}$ is obtained under the monopoly price $u/2$, and thus $\beta = 2(\overline{\theta} - \underline{\theta})/u$. The threshold price required to induce the adoption of a dual-channel distribution strategy, p_T, is derived from $\pi_D = \pi_A(p_A^*)$, which can be expressed as:

$$\left[1 - \frac{p_T}{u}\right]\left[p_T(\alpha - \beta p_T) + \frac{(p_T - c)}{n}(1 - \alpha + \beta p_T)\right] = \pi_A^*\left(p_A^*\right).$$

4.2. Choice of distribution strategy

4.2.1. Baseline case

We first consider the baseline case in which the share of loyal consumers θ is independent of the price level (i.e., $\theta'(p) = 0$). Fig. 1 describes the optimal price p_A and the threshold price p_T for different levels of the share of loyal consumers. Under a single-channel distribution strategy, the airline charges a monopoly price of $u/2$ to its loyal consumers who visit the airline's website. Since the share of loyal consumers θ does not depend on the price charged by the airline, the optimal price p_A is constant at \$200 in Fig. 1 regardless of the values of θ.

If the airline joins an OTA platform, it can reach a broader consumer base and make the same profit as under a single-channel distribution strategy with a lower price p_T. For a low share of loyal consumers, the airline cannot make enough profit from its single-channel distribution and its profit level can easily be achieved with a low threshold price under a dual-channel distribution. The airline is more likely to choose a dual-channel distribution strategy by joining the platform. As θ increases, the profit from its website becomes larger and a higher threshold price is required to achieve the same level of profit and thus the airline has less incentive to join the platform. The dotted line in Fig. 1 shows the difference between the two prices ($p_A - p_T$), which indicates the level of benefit that could be realized by joining the platform. If the share of loyal consumers is not responsive to price changes, an airline with a large base of loyal consumers (i.e., high θ) is less likely to join the platform.

4.2.2. Sensitivity of loyal consumers

Consumers who usually visit a specific airline website will leave it to search for better prices if the airline charges too high a price. The sensitivity of the share of loyal consumers, $\theta'(p)$, affects the

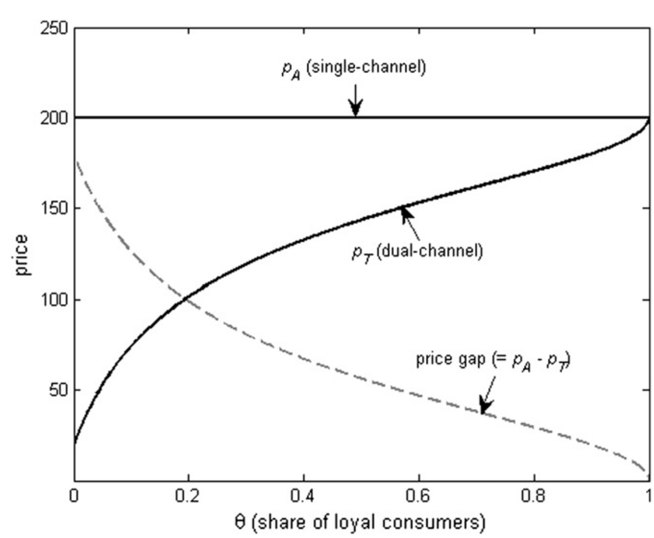

Fig. 1. Effect of the share of loyal consumers, with an exogenous value $\theta(p) = \theta$. The following parameter values are used for figure: $u = 400$, $n = 10$ and $c = 20$.

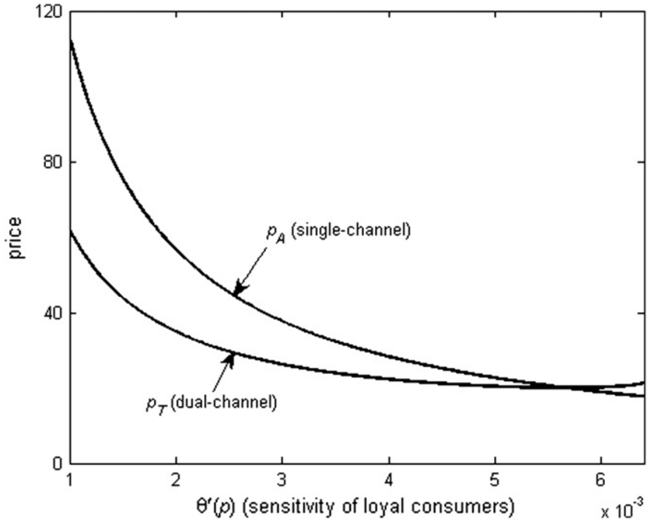

Fig. 2. Effect of the sensitivity of the share of loyal consumers, $\theta'(p)$. The following parameter values are used for figure: $n = 10$, $c = 20$, $\underline{\theta} = 0.1$ and $\overline{\theta} = 0.3$. The x-axis value is defined as $\theta\prime(p) = 2(\overline{\theta} - \underline{\theta})/u$, and the value of u is changed from 400 to 60.

price an airline can charge on its website and thus the choice of distribution strategy. Fig. 2 describes the optimal price p_A and the threshold price p_T for different sensitivity levels of loyal consumers, $\theta'(p)$. For the given functional forms, the absolute value of the sensitivity in the x-axis is $\beta = 2(\overline{\theta} - \underline{\theta})/u$.

If the sensitivity of loyal consumers is very low, the threshold price is much lower than the optimal price and the chance is greater that the dual-channel distribution strategy will be chosen. As the size of sensitivity increases, the advantage of a dual-channel distribution is reduced due to the low profit share from the OTA platform. With a high value of $\theta'(p)$, consumers are sensitive to small changes in price; by joining the platform the airline substantially reduces the profit from its website without a concurrent increase in profit from the platform. For a sufficiently high level of sensitivity (above 0.0055 in Fig. 2), the threshold price p_T is actually larger than the optimal price p_A, and the dual-channel strategy is not likely to be optimal.

4.2.3. Range of the share of loyal consumers

Fig. 3 shows how the lower bound of the share of loyal consumers ($\underline{\theta}$) affects the price levels. We let $\underline{\theta}$ vary between 0 and 0.3, where the value 0.3 implies that 30 percent of the consumers first visit the airline's website even if the airline charges a monopoly price. A low value of $\underline{\theta}$ implies that consumers are very responsive to price increases, thus, the airline must charge a low price to attract consumers under the single-channel distribution strategy. As $\underline{\theta}$ increases, the airline can increase its price without dampening demand and it can charge a monopoly price ($p_A = 200$) when the lower bound is the same as the upper bound (i.e., $\overline{\theta} = \underline{\theta} = 0.3$).

If the airline joins a platform, the threshold price also increases as the lower bound of the share increases, albeit at a slower rate. When $\underline{\theta}$ is small, consumers will be more sensitive to a change in price with a large β and consequently, the airline has an incentive to keep directing consumers to its website by adjusting the price. For a large $\underline{\theta}$, on the other hand, loyal consumers are less sensitive to price changes and thus the airline's marginal benefit from adjusting price on its website is smaller than the case of a small $\underline{\theta}$. Fig. 3 illustrates that the price gap between p_A and p_T increases with $\underline{\theta}$, implying that the airline is more likely join the platform for a large $\underline{\theta}$. In contrast to the results in Figs. 1 and 3 shows that if consumers' loyalty is sensitive to the price level, the airline with a large base of loyal consumers (i.e., high $\underline{\theta}$) is more likely to join the platform.

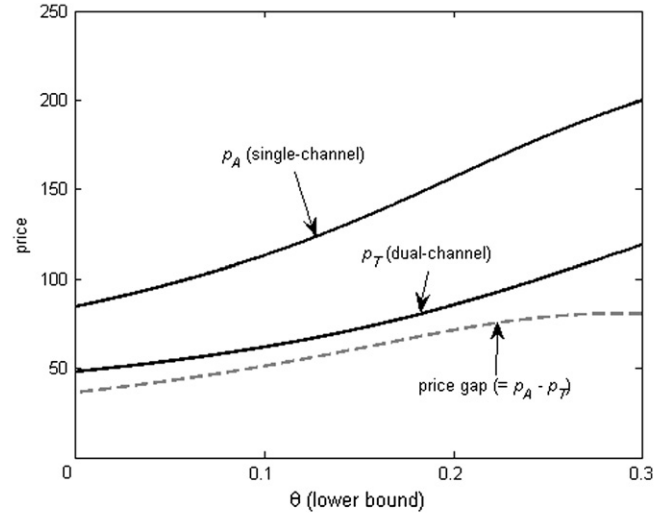

Fig. 3. Effect of the lower bound of the share of loyal consumers, $\underline{\theta}$. The following parameter values are used for figure: $u = 400$, $n = 10$, $c = 20$ and $\overline{\theta} = 0.3$.

Fig. 4 shows the effect of a change in the upper bound of the share ($\overline{\theta}$) on price levels, for a given level of lower bound (at $\underline{\theta} = 0.1$). When the upper bound coincides with the lower bound at $\overline{\theta} = 0.1$, the airline can charge a monopoly price $p_A = 200$ under a single-channel distribution strategy. As $\overline{\theta}$ increases, the share of loyal consumers becomes increasingly sensitive to price and the airline thus reduces the price to attract more consumers to its website. Under the dual-channel distribution strategy, the threshold price p_T gradually increases with $\overline{\theta}$ because the extra profit from the platform is not as large as with a small $\overline{\theta}$. The price gap between p_A and p_T declines with $\overline{\theta}$, implying that the airline has less incentive to join the platform for a high $\overline{\theta}$ because it has more room to adjust the price in its website.

4.2.4. Market competitiveness

Fig. 5 illustrates the effect of the number of competitors on the price levels. While the optimal price under a single-channel distribution strategy is independent of the number of competitors, the threshold price p_T under a dual-channel distribution strategy increases as more competitors join the platform. With more competition on the platform, the extra profit from joining the

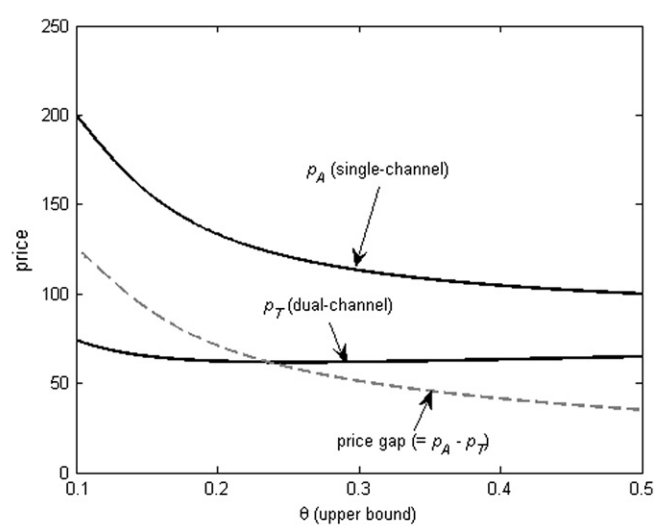

Fig. 4. Effect of the upper bound of the share of loyal consumers, $\overline{\theta}$. The following parameter values are used for figure: $u = 400$, $n = 10$, $c = 20$ and $\underline{\theta} = 0.1$.

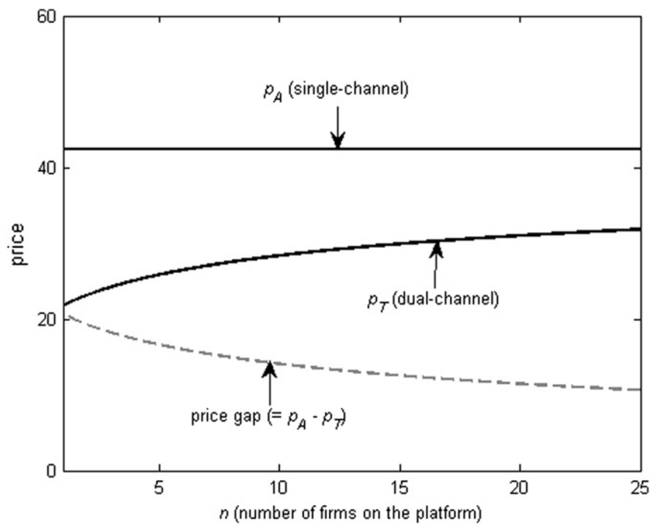

Fig. 5. Effect of the number of competitors, n. The following parameter values are used for figure: $u = 150$, $c = 20$, $\underline{\theta} = 0.1$ and $\overline{\theta} = 0.3$.

platform decreases because the profit obtained from its website drops due to a lower offered price. To compensate for the loss in profit from its website, the threshold price increases with n. Fig. 5 implies that an airline has less incentive to join a platform that more competitive (has a large number of firms), or that it is likely to join a platform if its routes are served by only a few airlines.

Though not reported, we can also consider the case where the threshold price is above the optimal price p_A and is decreasing with n, as is implied in equation (4). If the gap between the lower and upper bounds of the share of loyal consumers is, for example $\overline{\theta} = 0.6$ instead of $\overline{\theta} = 0.3$ in Fig. 3, the threshold price is decreasing above p_A. However, the qualitative result is the same: as the number of competitors increases, an airline has less incentive to join the platform.

5. Conclusions

OTA platforms offer airlines an additional channel to access and broaden their consumer base beyond the limited reach of the airline's brand.com websites. Despite this potential benefit, it is interesting why several major airlines have chosen not to distribute their tickets through such platforms, preferring to sell tickets solely through their websites. Furthermore, these airlines often outperform their competitors in profitability.

This study analyzes several factors that affect an airline's decision to sell tickets through an OTA platform or solely through their own websites. Assuming that the share of loyal consumers is endogenously determined by the airline's website price, this study illustrates the importance of consumers' response to price and market competitiveness. It demonstrates that when the share of loyal consumers inversely relates to the price, airlines are less likely to join an OTA platform; the decision depends on the size of loyal consumers' price elasticity. Some carriers (such as Southwest Airlines and Ryanair) have chosen to stay away from OTA platforms, partly because they can control the price offered to loyal consumers on their websites. In addition, this study shows that airlines have less incentive to join a platform if it is highly competitive.

The results from this study can provide useful guidelines for airlines' ticket distribution strategy. This study demonstrates the importance for airlines to create a large base of loyal consumers if they want to protect themselves from the fierce competition of OTA platforms. It also reveals that airlines should carefully consider consumers' price sensitivity, to ascertain how much of a price increase will likely divert consumers from their website to OTA platforms. Though we have considered a single-platform setting, airlines often are on multiple platforms, which may raise issues of coordination of distribution (i.e., which tickets are available and where) and pricing fees in different platforms.

This study examines the complicated process airlines must navigate in choosing a distribution strategy. Though we considered several plausible forms of distribution and share functions, our conclusion should be interpreted with caution because the exhaustive cases of all functional forms are not examined. This study focuses on demand-related factors in the airline's ticket sales distribution choices, but other factors, such as capital cost of creating, promoting and operating a website, are also important. A more comprehensive examination of this complex environment requires the development of more complex equilibrium pricing models, incorporating dual-channel distribution for all airlines in the market, and allowing them to set different prices on the OTA platform. Finally, it may be fruitful to explore a model with multiple OTA platforms and analyze the relationship between airlines and platforms when competition is present at different levels of the supply chain.

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