

Sporting Event Revenue Management with Consumer Resale

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Abstract

This paper studies a sporting event capacity provider's pricing strategies in the presence of consumer resale. Consumers' purchasing decisions in the primary market take into account the size of the resale market, the transaction cost of resale and consumers' inter-temporal valuations. We are interested in the question of whether allowing consumer resale of sporting events tickets increases or hurts the capacity provider's expected revenues. To analyze this question, we study market structures and revenues resulting from fixed pricing, dynamic pricing and pricing with options. We consider how the capacity provider's revenue changes with respect to the transaction cost of consumer resale under each pricing strategy. As the transaction cost increases (i.e., it becomes harder to resell tickets), the capacity provider's revenue from fixed pricing with advance sales decreases, the revenue from pricing with options increases, while the revenue change from dynamic pricing depends on the capacity and the transaction cost. From this we can characterize when consumer resale hurts or benefits the capacity provider with each strategy.

1 Introduction

Consumer resale is prevalent in sporting event ticket sales for the following two reasons. First, capacity providers make tickets available early in advance to satisfy the needs of those highly dedicated fans who want to secure the rights to attend events they are interested in, but are not necessarily willing to pay significantly more than those consumers who arrive later to purchase tickets [1][2]. Second, most tickets are transferable, non-refundable, and consumers purchasing event tickets usually have high uncertainty in valuations. A sports fan may not know whether her favorite team will get into the final game when she buys the ticket for it. A consumer may also find the event conflicting with some other appointment of higher priority. A consumer who cannot attend the event can resell the ticket to another consumer directly as well as through a broker. For example, a college student can resell a football game ticket to her classmate. Alternatively she can resell her ticket through brokers, among which StubHub, RazorGator, TicketsNow, eBay are major players. Brokers obtain profits by charging transaction costs that can be as high as 25% of the ticket resale value to the seller and the buyer. The development of online transactions on the Internet has provided more opportunities for such brokers to thrive.

No matter how consumers resell their tickets, traditionally the perception is that resale (secondary) markets are bad for the sporting event organizers and ticket distributors and need to be prevented. While most organizers and distributors support paperless ticketing (non-transferable tickets) to prevent resale, brokers support paper ticketing (transferable tickets) [3]. Paperless ticketing works like an airline e-ticket, with no traditional ticket printed when a customer places an order. Instead, a fan shows her credit card at the stadium gate to enter the sports game, guaranteeing that the person who originally placed the order is the same one attending the event and the ticket is not transferred to a third party. However, so far, there is no federal regulation regarding event ticket resale in the United States. Some states restrict resale, but anti-scalping laws are rarely enforced. In 2010, paperless tickets only made up 0.01% of all the tickets Ticketmaster processed¹. Moreover, it is not clear when and under what conditions the resale markets are harmful to the capacity providers as many college athletics departments and teams have partnered with brokers to create fan-to-fan ticket exchange marketplaces and encourage their fans to use these platforms to resell their tickets.

There are two major goals of event capacity providers in this challenging environment: first, tie prices to demand; second, capture the revenues lost to the resale markets. While the level of analytics and technology in event revenue management is far behind travel and retail revenue management, in recent years, sporting event capacity providers started to use dynamic pricing. For example, Ticketmaster has partnered with MarketShare to bring dynamic pricing to events, and San Francisco Giants has been using dynamic pricing for the last three years. The capacity providers are hoping that a more flexible pricing strategy can help them capture more of the event ticket market revenue. Recent dynamics of the sporting event tickets industry and the resale markets motivate our research questions: (i) How does consumer resale affect the capacity providers' prices and revenues? (ii) When are resale markets harmful to the capacity providers? (iii) Should capacity providers try to prevent the resale of tickets?

We develop a two-period model to study this problem. The consumers arriving in period 1 are usually fans who would like to avoid the risk of sell-out, and the ones arriving in period 2 are usually consumers who make their purchasing decisions at the last minute due to uncertainties on their schedules or on the event (e.g., a diehard soccer fan can buy a ticket for the world cup final without knowing which teams will be in the final while others will only buy if their country qualifies). Consumers have uncertain valuations which are realized at the beginning of period 2. If a period 1 consumer purchases an advance ticket, she can either use the ticket herself or resell it in period 2, depending on her realized valuation. Consumers pay a transaction cost when they resell their tickets. This transaction cost can be a search or inconvenience cost of a consumer who looks for a buyer to resell her ticket or a fee paid to the broker. A period 1 consumer may decide to postpone her purchasing decision to period 2 when she gains more information about her valuation. In this case, she can either buy from the capacity provider or from a reseller in the resale market. The capacity provider's goal is to maximize his expected revenue from selling his capacity over two periods.

2 Fixed Pricing

We first study the fixed pricing strategy which has been commonly used by sporting event capacity providers in practice. With fixed pricing, the capacity provider sets a single price for ticket sales

¹ See <http://www.cnbc.com/id/42707776>.

throughout the selling horizon. He can announce his fixed price and start selling early in period 1 when consumers have not learned their valuations and maintain this price till the end of period 2.

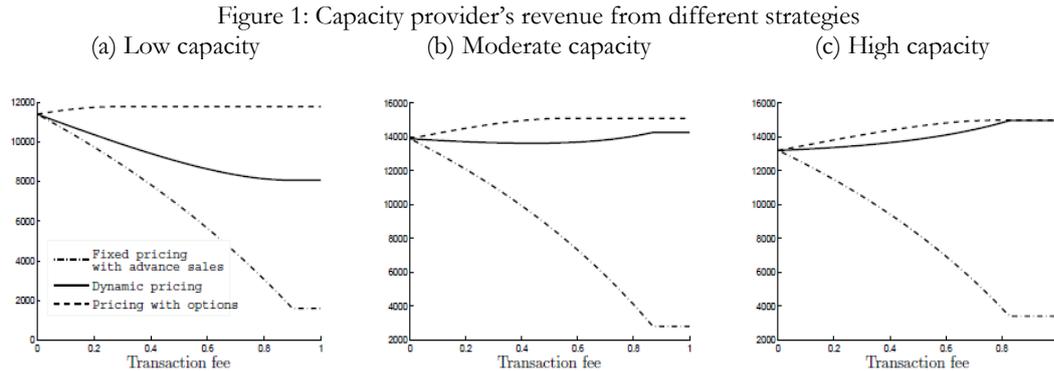
To analyze fixed pricing, we use backward induction to characterize the subgame perfect equilibrium of the sequential game between the capacity provider and the consumers. We find that in equilibrium, the resale price is larger than or equal to the capacity provider's fixed price. This inflation of ticket prices in resale markets close to event dates is often observed in practice and is one of the reasons capacity providers want to eliminate resale markets. However, we find that the capacity provider can gain higher expected revenues when the transaction cost of resale is small (or it is easy to resell) and there is more consumer resale in the resale markets. This is exactly the opposite of the belief of some capacity providers in practice. The intuition is as follows. As the transaction cost becomes larger, period 1 consumers value advance tickets less because it becomes more costly to resell tickets in resale markets. In order to induce them to make advance purchases, the capacity provider has to decrease his fixed price resulting in lower revenues. Therefore, the existence of resale market actually allows the capacity provider to charge a higher price and earn more revenue. In fact, StubHub is now the secondary ticketing partner for 20 collegiate properties nationally including the Big Ten Conference, North Carolina, Florida State and Virginia Tech, which provides evidence that college athletics departments benefit from partnering with StubHub to offer a resale option. Moreover, notice that a non-transferable ticket is equivalent to the case where the transaction cost is so large that no one wants to resell. The fact that the revenues decrease as the transaction cost increases implies that when the capacity providers use fixed pricing, they are worse off with non-transferable tickets.

3 Dynamic Pricing

Dynamic pricing strategies have started to be used by some capacity providers including Ticketmaster in practice. Of course, ticket prices can be changed many times before the event. Clearly, changing prices dynamically gives the capacity providers more flexibility so the fact that dynamic pricing results in higher revenues for the capacity providers than fixed pricing with advance sales is not too surprising. However, we are interested in whether with dynamic pricing, the capacity provider benefits or suffers from consumer resale. To model this, we assume the capacity provider announces his price for advance tickets at the beginning of period 1. After consumers learn their valuations at the beginning of period 2, the capacity provider can adjust his price to sell his remaining capacity. Similar to fixed pricing, we use backward induction to characterize the subgame perfect equilibrium of the sequential game between the capacity provider and the consumers.

We find that in equilibrium, the capacity provider's period 2 price is equal to the resale market price. This is because the capacity provider and the resellers compete for period 2 customers. If the two parties have different prices, the one with a higher price will reduce it to attract more consumers, and the one with a lower price will raise it to gain more margin. Therefore, the capacity provider and the resellers offer the same period 2 price. As in fixed pricing, the optimal period 1 price becomes lower when the resale transaction cost increases. However, the period 2 price exhibits different characteristics with respect to the transaction cost. This is because as the transaction cost increases and resale becomes more costly, the supply in the resale market shrinks, hence the resale price increases and the capacity provider's period 2 price increases. Unlike fixed pricing, the capacity provider's expected revenue from dynamic pricing can have three types of behavior with respect to the transaction cost and the capacity level. Figure 1 (solid lines) illustrates the behavior of revenue from dynamic pricing for several capacity levels. If a provider has very small capacity compared to demand, the provider is better off when it is easier for consumers to resell their tickets, as this

increases the valuation of the consumers for the event tickets and enables the provider to charge a higher price (Figure 1a). If the provider has a moderate level of capacity, he is better off with a larger transaction cost if the transaction cost is high enough and he is worse off otherwise (Figure 1b). If the provider has sufficient capacity, since he has enough remaining capacity to take advantage of the high period 2 price, he can always earn a higher revenue with a larger transaction cost (Figure 1c).



Our analysis verifies that dynamic pricing is strictly more profitable than fixed pricing for a capacity provider who sells tickets in advance. However, our results show that the benefit of dynamic pricing does not come from the shrinkage of resale markets. The capacity provider is better off with dynamic pricing because the flexibility to adjust the price in period 2 allows him to extract higher margins.

4 Ticket Options

In this section, we study another strategy, pricing with options, which would enable sporting event capacity providers to overcome some of the challenges from consumer resale markets. Options can be very attractive to consumers because options can help the consumers hedge against valuation and price uncertainty. The consumers expose themselves to low valuation risk by purchasing advance tickets as the event may conflict with the consumer's schedule which may not be known in advance. Also many sports employ elimination type tournaments, and an advance ticket may become worthless to a consumer if the athlete/team she supports does not qualify for the event (e.g., US Open Men's final). On the other hand, if they do not purchase the tickets in advance, they risk paying high prices in resale markets or capacity being sold out. With options, consumers can purchase the right but not the obligation to buy tickets closer to the event date. When a consumer is uncertain about her valuation for the event, she can pay a relatively small amount (option price) to secure the right of purchase and make her final purchasing decision after the uncertainty is resolved. She needs to pay an additional amount (strike price) if she wants to exercise the option to obtain a real ticket later. A consumer may want to exercise the option because her valuation is high enough (e.g., her favorite tennis player qualifies for the final) so she will use the ticket herself, or the resale price is at least high enough to compensate for the cost of the strike price if she resells the ticket.

We study a pricing scheme where the capacity provider sells (x, p) options in period 1 instead of advance tickets and determines the price to sell his remaining capacity in period 2 after consumer valuations are realized. x is the option price, i.e., the price to purchase a ticket option, and p is the

strike price, i.e., the extra amount to pay if one decides to exercise the option to obtain a real ticket. To reflect the fact that consumers would want to decide whether to exercise the options or not as the uncertainties are resolved (e.g., one knows her favorite tennis player qualifies for the final or not, or one's schedule on the event date is finalized), we assume options can be exercised in period 2 after consumers learn their valuations. The capacity provider's goal is to optimally set the option price, the strike price and the period 2 price so that his expected revenue is maximized. We do not allow the capacity provider to sell more options than the capacity although one might increase revenues by doing so. The reason is that there has been consumer backlash to firms that have sold more options than the available capacity. Event tickets have very low substitutability because each event only occurs once.

We again use backward induction to solve the sequential game between the capacity provider and the consumers. With options, in period 2, the period 1 consumers who have purchased options first decide whether to exercise the option or not. Then they decide whether to attend the event or resell the tickets. Similar to dynamic pricing, in equilibrium, the capacity provider's period 2 price is equal to the resale price due to competition. The number of period 1 consumers that finally obtain real tickets is affected by the strike price. If the strike price is smaller than the payoff from resale, all consumers that have purchased options exercise them (either to resell or use the tickets), hence pricing with options is equivalent to dynamic pricing. We then conclude that dynamic pricing is a special case of pricing with options, so pricing with options is at least as profitable as dynamic pricing. On the other hand, if the strike price is larger than or equal to the payoff from resale, the consumers who exercise the options use the tickets themselves, hence there is no consumer resale. In fact, we find that it is optimal for the capacity provider to choose a high enough strike price to eliminate consumer resale. Moreover, as the transaction cost becomes larger, the optimal strike price becomes lower, but the optimal option price and the capacity provider's optimal expected revenue become higher. Unlike fixed pricing or dynamic pricing, if the capacity provider sells options, he never benefits from the resale market. This is because with options, the capacity provider does not need resellers as market makers and he can earn a higher revenue by preventing consumer resale.

We already know pricing with options is at least as profitable as dynamic pricing, and Figure 1 (dashed curves) shows that it is strictly more profitable most of the time. The benefit of pricing with options mainly comes from the elimination of resale markets. This is done through pricing resellers out of the market by setting a high enough strike price. Additionally, with options, the capacity provider can use strike price to control the number of consumers who exercise the options to obtain real tickets. Since he can sell the expired options as real tickets in period 2, the capacity provider can better manage his capacity over two periods by properly choosing the strike price. Thus, if the capacity is not too high, with options, the provider actually sells more tickets in period 2 at a higher price than he could with dynamic pricing and his revenue increases. Therefore, not only does pricing with options enable the capacity provider to avoid consumer resale, but it also allows for better capacity management so that the capacity provider can extract higher margins from consumers.

Finally, we are also interested in which of the strategies we have analyzed benefits the whole value chain more, and which one benefits consumers most. Compared to fixed pricing, dynamic pricing decreases consumer surplus because it allows the capacity provider to charge higher prices. Although dynamic pricing decreases consumer welfare, it increases the capacity provider's revenues significantly resulting in an increase in the overall social welfare. When the capacity provider uses options, the consumer surplus remains the same as in dynamic pricing. On the other hand, options make the capacity provider even better off than dynamic pricing, so the social welfare is the highest among all strategies.

Our findings suggest that in the case of fixed pricing consumer resale benefits both the consumers and the capacity providers. Although dynamic pricing and options may decrease the consumer surplus under some conditions, because of the significant increase in revenues and social welfare, by sharing part of the benefit with consumers, capacity providers can design win-win solutions for the consumers and themselves.

5 Conclusion

In this paper, we study three pricing strategies, fixed pricing, dynamic pricing, and pricing with options, for a sporting event capacity provider that faces consumer resale. The major contribution of this paper is that we find how the capacity provider's prices and revenues can be affected by consumer resale with different pricing strategies. Consumers value advance tickets more when the transaction cost is smaller, i.e., when it is easier to resell, thus the capacity provider can charge a higher price for advance tickets. We find that the transaction fees set by the brokers have a significant impact on sporting event capacity providers' revenues. If the capacity provider uses fixed pricing, he earns a higher revenue with a smaller transaction cost. If he uses dynamic pricing, he benefits from a smaller transaction cost if he has insufficient capacity (the event is popular) or if his capacity is moderate and the transaction cost is small; otherwise he prefers a larger transaction cost. If he uses pricing with options, a larger transaction cost always makes him better off. Therefore, our results suggest that consumer resale isn't a threat to capacity providers with the traditional fixed pricing strategy and non-transferable ticketing is not necessarily a more profitable strategy. Even if some capacity providers have recently started to use dynamic pricing, non-transferable tickets are still not beneficial in many cases, especially for popular events. We have however seen also that providing options could increase capacity providers' revenues as well as improve social welfare with the added benefit of significantly reducing resale markets if the options are priced appropriately.

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