CLUB OBJECTIVES AND TICKET PRICING IN PROFESSIONAL TEAM SPORTS

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INTRODUCTION

An important question in the literature of professional team sports is whether clubs are profit maximizers or utility maximizers [Rothenberg, 1956; Sloane, 1971]. It turns out that these different objectives have serious implications for the club's talent demand, the competitive balance in the league, the player salary level and the ticket price, as well as for the impact of market regulations such as player transfer systems and club revenue sharing arrangements [Kesenne, 1996; 2000; Rascher, 1997; Fort and Quirk, 2004]. Some empirical evidence from the US major leagues confirms the hypothesis that the club owners' main objective is profit maximization [Demmert, 1973; Noll, 1974; Quirk and El Hodiri, 1974; Jones, 1969; Ferguson, Stewart, Jones and Le Dressay, 1991, Fort, 2003]. These empirical tests are mainly based on the pricing rule or the size of the estimated ticket price elasticity. However, it can easily be derived that the pricing rules of a win maximizing club and a profit maximizing club are exactly the same, so that the outcome of these tests supports the win maximization hypothesis as well [Salant, 1992, Fort and Quirk, 2004].

The general perception is that European clubs behave more like utility or win maximizers, but also some well-known US sports economists, such as Quirk and El-Hodiri [1974], wrote a long time ago: "*The assumption that the actions of franchise owners are motivated solely by profits from operation of their franchises is admittedly somewhat unrealistic. Owning a major league franchise carries with it prestige and publicity, and a wealthy owner might view it simply as a type of consumption; for such a sportsman owner, winning games rather than making money might be the motivating factor*". More recently, Zimbalist [2003] concluded from his discussion on club objectives that: "*owners maximize global, long-term returns and that these are very different from a team's reported annual operating profits*". So, also in the US major leagues the question lingers whether clubs are profit maximizers or win maximizers, or a combination of both [Rascher, 1997].

Starting from the profit maximization hypothesis, much research has been done on talent demand, competitive balance and salary levels [Fort and Quirk, 1995;

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Szymanski, 2002]. Kesenne [1996, 2000] and Ford and Quirk [2004] show that, under the win maximization hypothesis, the demand for talent and the ticket price are higher, leading to a worse competitive balance. Beside demand for talent and competitive balance, also gate ticket pricing has been studied. Noll [1974], Heilmann and Wendling [1976], Scully [1989] and Salant [1992], among others, analyzed the optimum pricing strategies of profit maximizing owners, including several revenue sources and adding stadium capacity restrictions. All found ticket prices that are set in the inelastic range of the demand curve. In a recently published article, Fort [2004] explores these empirical findings and shows the logic for inelastic gate pricing.

To the best of our knowledge, all these studies start from models with only one decision variable, talent demand **or** ticket price, keeping the other variable constant. Our contribution to this literature is that we start from a model with two decision variables: talent demand **and** ticket price, under both the profit and the win maximization hypothesis. We assume that team managers have to decide simultaneously, at the start of the season, how many talents they will hire and what ticket price they will charge. It is obvious that the ticket price affects revenue and that the club budget affects the talents they can afford and, vice versa: that the number of talents affect ticket demand and ticket price. This approach challenges a few well-known conclusions from economic research such as, 'a stadium capacity constraint results in a higher optimal ticket price' or 'higher players salaries do not affect the optimal ticket price if the marginal cost of spectators is zero', as well as the impact of some market regulations, such as imposing salary caps.

In what follows, we start with the comparison of the profit and the win maximizing hypothesis in a model that takes into account the simultaneous management decisions on ticket price and talent demand. This is done in the second section. The next section analyses the impact of a stadium capacity restriction on ticket price and talent demand. In the following section, policy implications such as imposing maximum ticket prices, imposing salary caps and granting a government subsidy are considered. The last section concludes.

THE PROFIT VERSUS THE WIN MAXIMIZATION HYPOTHESIS

In this section we develop a model of professional team sports comparing both optimal ticket prices and talent demand in the profit and the win maximization scenario. After specifying the model, we introduce profit and win maximization and compare the outcomes, using some clarifying graphical presentations. A comparative statics analysis allows us to derive the impact of the salary level and the size of the market.

Maximizing the winning percentage of a team, as a special case of utility maximization, is a rather specific but not unrealistic objective for professional sports clubs. It should be clear that the win maximization model does not completely disregard profits or losses. Only, profits are not maximized in this approach, because clubs have also other objectives such as winning. If we assume a club to be mainly interested in sportive success, which means trying to win the championship or as many games as possible, the only way to reach that goal is to hire as much playing talent as possible, within the limits of the (expected) budget, or given a fixed profit rate that is needed to satisfy the owners or the shareholders, or to finance stadium investments or talent development. As far as a rich club owner considers his favorite sport as a consumption activity, he can as well be prepared to put in some of his money with no expected return. Also this situation can be handled by the win maximization approach.

The most important assumptions that are generally made in the literature on professional team sports are that clubs are local monopolists and price-makers on the product market. Clubs are wage-takers on the player labor market. The unit cost of a playing talent is determined by demand and supply on a 'free agency' player labor market or on a competitive transfer market where players are traded by the owners. Since the marginal cost of spectators is very small, it is assumed to be zero. We also start the analysis by making the assumption that there are no stadium capacity restrictions, which is a simplifying assumption that will be dropped in the next section.

Under these hypotheses the following demand function for stadium tickets can be specified

$$A = A(m, p, l) \tag{1}$$

with $A_m > 0 \quad A_p < 0 \quad A_l > 0 \quad A_{ll} < 0 \qquad A_{pm} > 0 \quad A_{lm} > 0 \quad A_{pl} = 0$.

A is a clubs' season attendance, p is the ticket price, l is a team's playing talent and m is the size of the market. Subscripts are used to indicate first partial derivatives. We assume that the size of the market, which determines the drawing potential of a club, cannot be changed by club management. The empirical evidence shows that large market clubs have more spectators than small market clubs (A_m>0). The demand for stadium tickets is assumed to be a downward sloping function of the ticket price (A_p<0). Spectators prefer to see winning teams. The winning percentage, i.e. the percentages of season games won, is one of the most important variables explaining the difference in total season attendances between clubs [Noll, 1974; Cairns, Jennett and Sloane, 1986; Scully, 1989; Downward and Dawson, 2000; Garcia and Rodriguez, 2002]. A team cannot control the winning percentage directly but it can change the number of playing talents. The player labor market is clearly not homogeneous, each player has a different number of talents, so l is the total number of playing talents and not the number of players. The winning percentage is a function of the relative playing talent of a team, which is the ratio between its playing talent and the total supply of playing talent. If we assume the total supply of talent to be constant in a closed league, and normalized to equal unity, the demand function can as well be written in terms of the number of playing talents (A_l>0). For a further discussion of this important constant-supply issue, we refer to Szymanski and Kesenne [2004]. It cannot be denied that also the closeness of the competition or the so-called 'uncertainty of outcome' affects the interest of spectators and the clubs' revenue. We therefore assume that playing talent has a positive but decreasing marginal effect on a club's season attendance (A_{ll}<0). Moreover the impact of price and talent on ticket demand are assumed to be larger for large market clubs (A_{pm}<0;A_{lm}<0). Because we do not have any empirical indication about the sign of A_{pl}, and because there seems to be no obvious reason for it to be large in positive or negative sense, we assume it to be zero, which implies that the ticket demand function is strongly separable in ticket price and talent.

The season revenue of a modern professional sports club not only consists of gate receipts, but also increasingly depends on broadcasting rights, sponsoring and merchandizing. However, there exists a strong positive correlation between a club's stadium attendance and most of its other revenues. Sponsors are more interested in a successful club and television companies prefer to broadcast games that are watched by many people. Also, the merchandizing business profits from a large number of spectators. The possible negative effect that broadcasting a game might have on stadium attendance is too small to offset this dominant positive correlation. Therefore, we assume that all nongate revenues are proportional to the number of attendances with proportionality factor q. This simplifying assumption does not take into account possible complications that arise when clubs receive local television rights [Fort and Quirk, 1995; Vrooman, 1995], it actually reduces the approach to a model that is almost identical to a gate-only world. So, total club revenue R can be written as

$$R = (p + q)A \tag{2}$$

A club's total cost C consists of labor and non-labor costs. In a free agency system, the unit cost of a playing talent is the wage per playing talent *(w)*. The capital cost *(c^0)* is considered to be constant in the short run.

If clubs are **profit maximizers** we can write the profit function as

$$\pi = (p + q)A - wl - c^0 \tag{3}$$

The first-order conditions for a maximum are

$$\pi_p = (p + q)A_p + A = 0 \tag{4}$$

$$\pi_l = (p + q)A_l - w = 0 \tag{5}$$

From equation (4), which is the pricing rule, it can be easily derived that the price elasticity is smaller than unity. In equation (5) we see that a team will hire playing talent until marginal revenue equals marginal cost. The second-order condition for a maximum requires the Hessian matrix to be negative definite, so that the following inequalities must hold:

$$\pi_{pp} < 0 \qquad \pi_{ll} < 0 \qquad \pi_{ll}\pi_{pp} - \pi_{pl}^2 > 0 \tag{6}$$

where

(7) $$\pi_{ll} = (p+q)A_{ll} < 0$$

(8) $$\pi_{pp} = (p+q)A_{pp} + 2A_p < 0$$

(9) $$\pi_{pl} = \pi_{lp} = (p+q)A_{pl} + A_l = A_l > 0$$

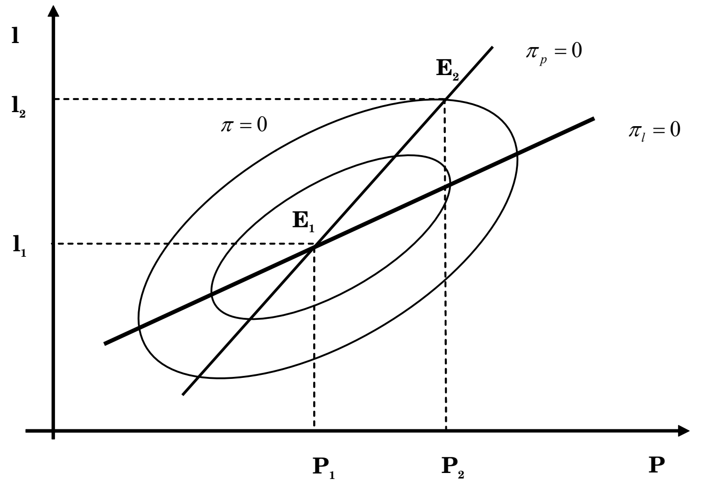
We can now illustrate these conditions graphically. From the total differential of the equations (4) and (5) we can find the slopes of the locus and in the *p-l* diagram:

(10) $$\left.\frac{dl}{dp}\right|_{\pi_p=0} = -\frac{\pi_{pp}}{\pi_{pl}} > 0$$

(11) $$\left.\frac{dl}{dp}\right|_{\pi_l=o} = -\frac{\pi_{pl}}{\pi_{ll}} > 0$$

Given the properties of demand equation (1) and the second-order conditions in equations (6), both slopes are clearly positive. From the second-order conditions, we can also derive that the slope of the locus π_p=0 is steeper than the slope of the locus π_l=0. This is shown graphically in Figure 1. The two first-order conditions for profit maximization are met in the point of intersection E_1 of the two loci, which marks the optimal price level p_1 and the optimal number of playing talents l_1.

FIGURE 1
Profit and win maximizing equilibrium



Turning to the comparative statics analysis, in order to derive the impact of an exogenous change in player salary on ticket price and talent demand, and differentiating the first-order conditions in equations (4) and (5) with respect to the unit cost of talent w, one can find that

(12)
$$\frac{\partial p}{\partial w} = -\frac{\pi_{pl}}{\pi_{ll}\pi_{pp} - \pi_{pl}^2} < 0$$

(13)
$$\frac{\partial l}{\partial w} = \frac{\pi_{pp}}{\pi_{ll}\pi_{pp} - \pi_{pl}^2} < 0$$

Contrary to what is generally claimed by many American club owners, who argue that player salaries have to be kept low in order to keep the ticket prices low, a higher salary level turns out to reduce the optimal ticket price in the profit maximizing scenario. The reason is that a higher salary reduces the demand for talent, which causes the demand curve for tickets to shift to the left so that the profit (or revenue) maximizing ticket price will be set at a lower level. In Figure 1, a higher salary level will shift the locus $\pi_l = 0$ down so that the optimal ticket price and talent demand will be lower. Applying the envelope theorem to profit function (3), it follows that higher player salaries reduce owner profits. This is probably the real reason why owners are talking player salaries down.

The comparative statics analysis also confirms that large market clubs hire more talents and charge higher ticket prices than small market clubs. In Figure 1, a larger value of m will shift the locus $\pi_l = 0$ to the left and the locus $\pi_p = 0$ to the right so that, at the new point of intersection, both the ticket price and the demand for talent are higher.

Turning to the **win maximizing scenario**, a club's objective is to maximize the season winning percentage, which can only be done by maximizing the number of playing talents. It is not necessary to stick to the breakeven constraint, because the constant capital cost (c^0) can also include a certain amount of positive or negative profits. Because the capital stock is constant in the short run, a constant amount of profits also means a fixed profit rate. So, we no longer assume that clubs are profit maximizers, but that they can be profitable, break even or make a loss. In this approach we follow the model introduced by Kesenne [1996, 2000], realizing that adding this constraint is a simplification because it does not allow the (utility maximizing) owner preferences to enter the analysis. Our aim is only to find out how the results change if two decision variables are introduced in this model.

If clubs maximize the number of playing talents l under the following restriction

(14)
$$(p+q)A - wl - c^0 = 0$$

the first-order conditions for win maximization can be written as

(15) $$(p+q)A_p + A = 0$$

(16) $$(p+q)A_l = w - \frac{1}{\lambda}$$

(17) $$(p+q)A - wl - c^0 = 0$$

where λ is the positive Lagrange multiplier. Equation (15) is the pricing rule which turns out to be exactly the same as under the profit maximization hypothesis. From equation (16) it can be seen that a win maximizing club will hire playing talent up to a point where marginal revenue is lower than marginal cost.

In order to compare the optimal price level and number of playing talents under the profit and win maximizing hypothesis we try to find the iso-profit contours in the *p,l*-diagram. From the total differential of the profit function in equation (3) we find that the slope of the iso-profit contours through a point (*p,l*) is given by:

(18) $$\frac{dl}{dp}\Big|_{d\pi=o} = -\frac{\pi_p}{\pi_l}$$

It follows that this slope is zero for all points (*p,l*) where π_p=0 and is infinite for all points (*p,l*) where π_l=0. The iso-profit contours can now be added to the graphical presentation of the first-order conditions. One of these contours is the zero-profit contour. If a club maximizes the number of talents under the restriction of a fixed profit rate, the equilibrium point is E_2 in Figure 1 with price p_2 and playing talent l_2. It turns out that both the demand for playing talent and the ticket price are higher in a win maximizing club.

From the comparative statics analysis, it can be derived that also in the win maximizing scenario the impact of the salary level on talent and ticket price is negative and that the impact of the size of the market is positive. So, this result turns out to be robust.

STADIUM CAPACITY RESTRICTIONS

In the more simplified model, where clubs only determine the optimal ticket price given a constant talent demand, it is obvious that a higher ticket price can be set if the club faces a stadium capacity restriction. The more interesting question is how a stadium capacity restriction affects both the optimal ticket price and the demand for talent in a profit and in a win maximizing league. A stadium capacity restriction can be written as

(19) $$A^0 \geq A(m,p,l) \quad \text{or} \quad l \leq A^{-1}(m,p,A^0)$$

where A^0 is the capacity of the stadium. In Figure 2 this restriction can be drawn as an upward sloping line in the p - l diagram, where only the points below the line are feasible. If the constraint is binding, the new equilibrium for a profit maximizing club is found at the point of tangency between this restriction and the highest possible iso-profit curve. Given the properties of the ticket demand function, this restriction can be a convex function. A sufficient condition for the capacity constraint to be convex is that $A_{pp} \leq 0$. However, this does not cause any problem because the second order conditions are satisfied. The first order conditions can be written as

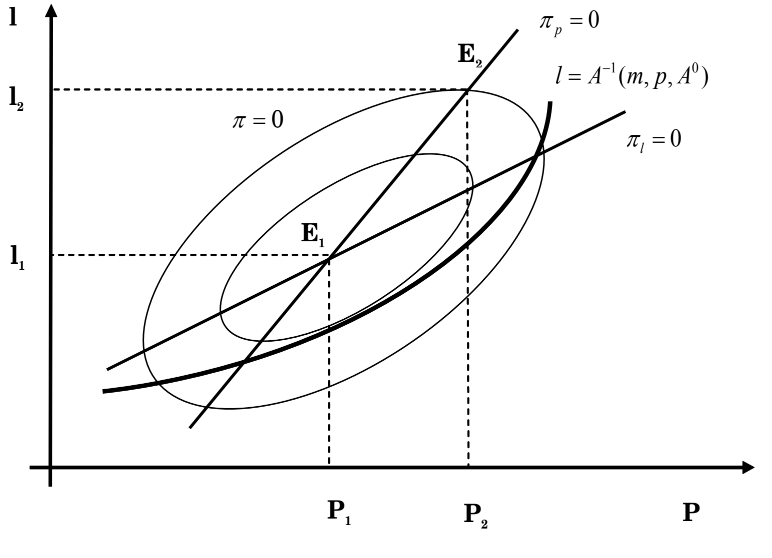
(20) $$(p+q-\mu)A_p + A = 0$$

(21) $$(p+q-\mu)A_l - w = 0$$

(22) $$A^0 - A = 0$$

where μ is the positive Lagrange multiplier. Comparing these conditions with the unconstrained model reveals that it is theoretically undetermined whether the level of the ticket price and the demand for talent is higher or lower than in the unconstrained profit maximizing model.

FIGURE 2
Stadium Capacity Restriction



For a win maximizing club the impact of a capacity restriction is different. Given the two constraints to the maximization of the winning percentage:

$$(p+q)A - wl - c^0 = 0 \tag{23}$$

$$A^0 - A = 0 \tag{24}$$

the optimal ticket price and demand for talent can be found at the upper intersection point E_2 of the capacity constraint and the zero-profit contour in Figure 2. It follows that, in the case of a binding capacity restriction, the demand for talent will always be lower than in the case of no capacity restriction. The optimal ticket price can be higher if a capacity restriction is imposed, but it will come down when the capacity is further reduced, i.e. when the curve representing the capacity constraint moves south-east.

The comparative statics analysis tells us that the impact of a changing salary level is again negative on both the optimal ticket price and the demand for talent. Also a larger market size leads to a higher ticket price and talent demand.

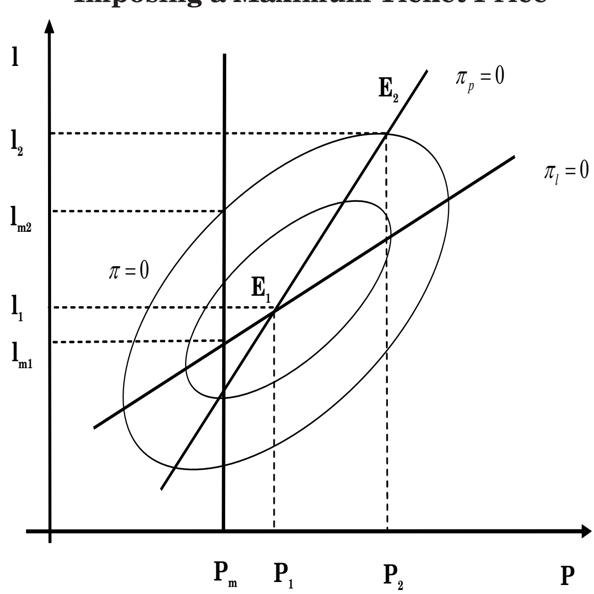
SOME POLICY IMPLICATIONS

A first policy implication of these results is that some price regulation for win maximizing clubs can be justified. Imposing maximum ticket prices is needed not only because of the local monopoly position of most clubs, but also because of the higher price set by win maximizing monopolists compared with profit maximizing monopolists. However, one should take into account that in the win maximizing scenario the supporters may also get a better product because some clubs are fielding more playing talent. As can be seen in Figure 3 imposing a maximum ticket price, such as p_m, which is a vertical line at the level of the maximum price, results in a lower demand for playing talent in both the profit (l_{m1}) and the win maximizing (l_{m2}) scenario. Its impact on attendance will depend on the relative size of the price elasticity and the talent elasticity of ticket demand. If it does not change the total number of spectators in the stadium, imposing maximum ticket prices can change the composition of the stadium public, because lower prices will probably attract the more price-elastic low-income people but a lower win percent will keep away the more win-elastic supporters.

It should be noted that, for each individual club in this model, the salary level is exogenous. However, if all clubs in a league reduce their demand for talent, due to the imposed maximum ticket price, this will also lower the equilibrium salary level on the competitive player labor market. And a lower salary level will increase the demand for talent so that the final effect on the demand for talent of imposing a maximum ticket price is theoretically undetermined.

Another policy implication is the effect on the optimal ticket price if the league imposes a salary cap on profit maximizing clubs. In fact, an NBA style of salary cap is a cap on the total payroll of a team, an equal amount for all clubs, which is at the same time a floor for the small market (low budget) clubs. It is determined as a percentage of defined gross revenue of the league during the previous season divided by the number of teams. The NBA style of a payroll cap requires also some revenue sharing or cross-subsidization among clubs to accommodate the possible financial losses that the cap might create for the small market clubs. In theory, the obvious result is a lower average salary level and an equal distribution of talents among clubs with the large market clubs' talents decreasing and the small market clubs' talents increasing [Quirk and Fort, 1992]. In Figure 4, the salary cap for the large market clubs, cap_1, can be drawn as a horizontal line below the competitive market equilibrium level E_1. The new equilibrium is found at the intersection of the cap_1-line and the locus π_p=0 which implies a lower ticket price (p_3<p_1). However, for the small market club the result is different, because the cap-line is now a horizontal line above the competitive market equilibrium, so that the small market club will increase its ticket price as they will also increase their hiring of talent. The upward shift of the locus π_l=0, due to the lower salary level, does not affect these results because this locus has been made irrelevant by the cap.

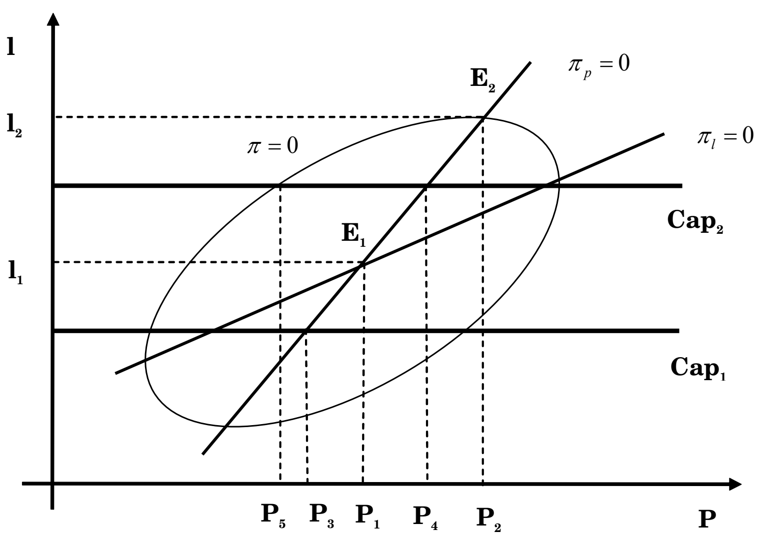
FIGURE 3
Imposing a Maximum Ticket Price



Again, the situation is different if clubs are win maximizers who try to maximize the number of talents. If the NBA style of salary cap fixes the number of talents a club has to hire, this objective is no longer relevant. For a large market club, facing salary cap_2, the optimal ticket price depends on the next-important objective of the win maximizing club, which can be revenue maximization (p_4<p_2) or the maximization of attendances (p_5<p_2). In both cases, the optimal ticket price is lower, but much lower if the club wants to maximize its number of spectators. For a small market club, that has to hire more talents than in a competitive equilibrium with the money it receives from cross-subsidization, the optimal ticket price will again be higher.

One last policy implication is the impact of a lump sum (government) subsidy to a club. If the club is a profit maximizer, a lump sum transfer does not change the optimal ticket price or talent demand, for obvious reasons. The amount of the subsidy only adds to the owner profits. However, if that club is a win maximizer, it can be seen that the demand for talent goes up and that, which is somewhat counter-intuitive, also the optimal ticket price goes up. A lump sum subsidy can be introduced in Figure 4 by drawing a wider iso-profit (iso-loss) contour than the zero-profit contour. It follows that both the ticket price and the talent demand increase. If the objective of the government subsidy is to make the ball park more democratic, it has to impose a maximum ticket price together with providing the subsidy. This way, the same talent demand as before can be reached with a lower ticket price.

FIGURE 4
The Impact of Salary Cap



CONCLUSION

In this paper we have compared the win maximizing objective of a sports club with the more conventional profit maximizing objective, in a model where club managers have to decide simultaneously on the optimal ticket price and talent demand. One of the important conclusions is that win maximizing clubs not only hire more talents but also charge higher ticket prices than profit maximizing clubs. Some rather counter-intuitive results have been derived concerning the impact of player salary levels and government subsidies on ticket prices. Also, imposing a salary cap lowers the ticket price of large-market clubs, but it will raise the ticket price of small-market clubs. What these results point to is the urge to find out whether the owners of professional sports clubs are profit or win maximizers. So far, the empirical research has not been able to distinguish between both objectives.

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