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**Economic analysis of the 12th man:  
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**JEL Codes:**

**Keywords: Sports Economics, ticket pricing, TV rights, supporters.**



# Economic analysis of the 12th man: should the fans be paid?

Luc Arrondel, Jean-Pascal Gayant and Jean-François Laslier\*

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## Abstract

The paper studies the pricing of tickets by considering the trade-off between maximizing match day revenues, through high prices, and maximizing the support of the most demonstrative fans, through low prices, in order to increase the number of victories, hence the revenue from TV rights. We model the role of effusive spectators and show that, in a competitive equilibrium, it may be optimal for the club to subsidize their presence in order to take full advantage of the 12th man effect.

**key-words:** Sports Economics, ticket pricing, TV rights, supporters.

## 1 Introduction

The Covid crisis shed light on the importance of the presence of supporters for the attractiveness of sporting show. When watching matches played behind closed doors, the television viewers realised, by contrast, the decisive contribution of the most effusive spectators to the show. It became clear that team game matches are a joint production of three, rather than two, actors: the two rival teams plus the supporters. The supporters produce the “sincere soundtrack” of the emotion, which is a fundamental ingredient that generates

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the customer's satisfaction, in the stadium as well as in front of the television screen.<sup>1</sup> The obvious importance of the role of the spectators, and in particular of the most demonstrative ones, has resulted in the disappearance of closed-door matches during the most recent waves of the pandemic. For instance, in France, the principle of a maximum capacity (5,000 spectators) replaced the closed-door games during the 5th wave in January 2022. At the European level, the promoters of the *Super League* project for football<sup>2</sup> went even further and suggested to fully integrate the fans in the future *Major League* ecosystem: following a very strong public rejection in April 2021, the project's promoters made changes in October 2021 by (i) creating endowments to subsidize fans' travel to away games, (ii) capping the price of half of the tickets for fans, and (iii) reserving 70 per cent of the seats for the fans of the finalist teams.<sup>3</sup>

The possibility of a cap on ticket prices is a response to the discontent of a certain segment of fans, often from working-class backgrounds, who have seen ticket prices soar since the early 2000s. In the *Premier League*, in particular, the organizers have sharply increased prices in line with the growing success of the competition, which has contributed to a form of "gentrification" of the public. In a caricature, the most active and demonstrative supporters, the ultras,<sup>4</sup> have been chased away by spectators with higher purchasing power but rather passive during the games. As a result, the atmosphere in the stadiums, now populated by wealthy, silent and demanding spectators, has deteriorated considerably. The clubs, aware of this pitfall, are therefore trying to keep a quota of relatively cheap seats, reserved for loyal season ticket holders. Thus, a form of arbitration has gradually emerged between the presence of two types of spectators in the stadiums: relatively passive spectators with a high willingness to pay on the one hand, and very demonstrative spectators with a lower willingness to pay on the other. While the former maximize match-day revenues, the latter contribute to the atmosphere in

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<sup>1</sup>During some televised matches, to compensate for the absence of spectators, clubs have sometimes set up a sound system based on past recordings of background noise and spectators' reactions. The result was often mediocre, sometimes with a soundtrack that was out of sync with the real images.

<sup>2</sup>Real Madrid, FC Barcelona and Juventus Torino.

<sup>3</sup>See Wettach (2021) and the Super League web site: [thesuperleague.com](https://thesuperleague.com)

<sup>4</sup>The term is not fully appropriate. The reality of ultras is complex (Bromberger and Lestrella 2008) and the opposition between active and passive spectators cannot be summarized as an opposition between ultras and non-ultras. We use this denomination for convenience, while remaining fully aware of its reductive character.

the stadium and to a possible 12th man effect that is supposed to increase the winning percentage, improve the home team's ranking and increase the share of broadcasting rights distributed at the end of the competition (Andreff 2006).

The home advantage in team sports, i.e., the phenomenon that playing in one's own stadium increases the chances of winning the game, is a well-documented phenomenon in the literature (see, for example, Schwartz and Barsky (1977), Courneya and Carron (1992), Jamieson (2010)). This advantage varies across sports but is generally stronger in football: for example, Ponzio and Scoppa (2018) estimate that, on average, the probability of winning increases by 23% for teams playing in their home arena. How then can this "home advantage" be explained?

Three factors are put forward: fan support, travel fatigue, and the habit of playing on one's home field. However, most empirical studies show that the main factor explaining this advantage is the "12th man" effect. There are two reasons for this: on the one hand, fans may encourage home players to perform better and, conversely, inhibit visiting players; on the other hand, fans may influence the referee by exerting a kind of social pressure to favor the home team ("referee bias" c. f. Dohmen and Sauermann (2016)). Furthermore, long travel can tire visiting players and thus increase home advantage; for teams in the elite leagues, especially the wealthier clubs, this factor has probably diminished over time (air travel is becoming more comfortable, c. f. Atkinson. and Reilly (1996)). Finally, the habit of playing on one's own field, whose surface, dimensions or climatic conditions are known, may give the home team an advantage (c.f. Pollard (2002)). While empirical studies agree that the home advantage does exist, there is no consensus on the relative importance of the different factors. Moreover, the data do not always allow for differentiation between them: it is possible to measure the effect of the audience indirectly by varying attendance, travel distances or by comparing the characteristics of countries showing different degrees of advantage; for more precise analyses, it is possible to study derbies played in the same stadium or cases of temporary closures following disciplinary sanctions (due to fan violence), but these situations are rare and the sample sizes are very limited indeed. To test the home advantage hypothesis and its various assumptions, it is preferable to be able to compare the performance of teams when they play at home with and without fans, all other things being equal.

During the 2019-2020 season, the Covid-19 pandemic in Europe and elsewhere forced professional football leagues to suspend championships for sev-

eral months. Some leagues decided to end the season while others, such as France, went all the way through. Nevertheless, for those who resumed the competition, health regulations imposed the closed-door rule. The number of matches without spectators that could be included in a statistical analysis increased drastically. The introduction of these closed-door matches is a natural experiment to study the impact of crowd pressure on referees' decisions (referee bias), on players' behavior on the field, whether through fouls committed (yellow or red cards) or performances (number of shots and shots on target), and on the outcome of matches (number of goals or points).

Many studies have taken advantage of this closed-door environment to study the home advantage. Although these studies show a decrease in home wins when games are played behind closed doors, this does not always appear to be significant (Caiazzo et al. (2022)). On the other hand, most articles agree on the fact that a referee bias exists when the stands are full: fewer fouls are called, fewer yellow cards and fewer red cards are shown to the visiting team when the stadium doors are closed, and conversely, the home team is penalized more (c.f. Bryson et al. (2021), Endrich and Gesche (2020)). Some works also observe a decrease in the performance of home footballers (Cross and Uhrig (2023)): fewer shots on goal (both on and off target), fewer dangerous situations for the visiting team (c.f. Wunderlich et al. (2021)). In summary, the closed-door games (sometimes called “ghost games”) played during the Covid pandemic, highlighted the positive role of fans on the results of their home team.

While the issue of home advantage has been the subject of much recent work, the trade-off between passive spectators contributing to the maximization of match day revenues and active spectators contributing to the attractiveness of the show and the twelfth man effect has not, until now, been the subject of any modeling attempt.

In this paper, we formalize a game between the  $k$  teams of a league (Andreff 2009) that each maximize an objective function that is a combination of their profitability and sports success. The revenues are of two types: match day revenues and TV rights revenues. The only costs are the salary costs related to the remuneration of the talents. The talent in each team determines its “pure sporting level”, but the competitive level also depends on the intensity of the active spectators' encouragement (12th man effect). The ranking of the club within its league depends of its own competitive level compared to the competitive levels of the other clubs. For the sake of simplicity, the double question of the contribution of active spectators to the

television attractiveness of the show and to the probability of victory of the host team is merged into this single 12th man effect: we consider that these two effects tend to increase the fraction of the TV rights allocated to the team concerned.<sup>5</sup>.

## 2 Model

In a league of size  $k > 1$ , each club  $i \in 1, \dots, k$  maximizes an objective  $G_i$  which is a linear combination of its realized profit (denoted  $\pi_i$ ) and of the sporting achievement (denoted  $r_i$ ). Precisely, we suppose that there exists a club-specific parameter  $\beta_i \geq 0$  such that:

$$G_i(p_i, s_i) = \pi_i + \beta_i r_i.$$

where  $p_i$  the price of a ticket at club  $i$ 's stadium and  $s_i$  is the team's pure talent or "sports level".

The sports level, which depends on the level of the recruited players, is directly determined by the remuneration of the players. The wage bill of club  $i$  is therefore a function  $w_i = W(s_i)$ .

It would be quite natural to assume that the number of spectators in the stadium of team  $i$  depends on the price of the seats. To simplify the solution, we will assume that this number is fixed and equal to  $n_i$ , which is none other than the capacity of the stadium of team  $i$ . This option is motivated by the choice to focus on the distribution of the spectators between 2 categories: the well-to-do and not very demonstrative spectators on the one hand, and the fans, often coming from working class backgrounds, who strongly encourage their team (the "ultras") on the other hand. Our hypothesis amounts to considering that the stadiums are always full, but that the (unique) price charged determines the breakdown between the two categories of spectators.

The channel through which this phenomenon of encouragement passes is modeled by a variable that measures the atmosphere in the home stadium, denoted  $a_i$ , which depends negatively on the price of the seats:  $a_i = A_i(p_i)$ . In all what follows we use the following simple form:

$$a_i = \bar{a}_i - \varepsilon_i p_i$$

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<sup>5</sup>In France, for example, the TV rights are mainly distributed according to two criteria: the team's ranking during the previous season and a measure of reputation. The double effect we are studying (ranking and attractiveness) is, schematically, in line with these criteria

where  $\bar{a}_i$  is a reference atmosphere level in the stadium and  $\varepsilon_i > 0$  is the price sensitivity of the supporters.

The effective competitive level of the team  $i$ , denoted  $c_i$ , depends on both the pure sport level and the atmosphere in the arena. We simply take:

$$c_i = s_i + \alpha_i a_i$$

where  $\alpha_i > 0$  measures the efficiency of the “encouragement technology” of their local team by the supporters: this can be called the 12th man effect, and it can vary from one club to the other.

Let us now formalize the interaction between clubs. The sporting success of a club depends on its competitive level but also on that of other clubs. We denote this variable by  $r_i$  (as a ranking):

$$r_i = R(c_i, c_{-i})$$

and simply take:

$$r_i = \frac{c_i}{\sum_j c_j} = \frac{s_i + \alpha_i a_i}{\sum_j (s_j + \alpha_j a_j)}.$$

The other source of revenue for the clubs is the TV rights windfall, denoted  $M$ . We will assume that the TV rights distribution rule follows the sporting success of the clubs. Therefore:  $d_i = D(r_i, r_{-i})$  and, in this paper, we stick to a linear rule:

$$d_i = M r_i.$$

We will also assume that the market for players is fluid and that the function  $w_i = W(s_i)$  is identical for all clubs. We simply take:

$$w_i = \frac{\lambda s_i^2}{2}.$$

The profit of club  $i$  is:

$$\pi_i = n_i p_i + d_i - w_i$$

so, using the piece of notation

$$m_i = M + \beta_i,$$

the club’s objective function can be written as:

$$G_i = n_i p_i + m_i r_i - w_i.$$



The club maximizes this as a function of the two variables  $p_i$  and  $s_i$ . The first order conditions for the maximization with respect to  $p_i$  and  $s_i$ , given the decisions of the other clubs are:

$$\begin{aligned}\frac{\partial G_i}{\partial p_i} &= n_i + m_i \frac{\partial R}{\partial a_i} \frac{\partial A_i}{\partial p_i} = 0 \\ \frac{\partial G_i}{\partial s_i} &= m_i \frac{\partial R}{\partial s_i} - \frac{\partial W}{\partial s_i} = 0\end{aligned}$$

In our model, where the competitive level is linear with respect to the pure sport level and the atmosphere, one always gets:

$$\frac{\partial R}{\partial a_i} = \alpha_i \frac{\partial R}{\partial c_i} = \alpha_i \frac{\partial R}{\partial s_i}.$$

The first order conditions for the club  $i$  are thus:

$$n_i = \alpha_i \varepsilon_i m_i \frac{\partial R}{\partial c_i} \quad (1)$$

$$\frac{\partial W}{\partial s_i} = m_i \frac{\partial R}{\partial c_i} \quad (2)$$

and one can remark that, for the club  $i$ , the following equation is always satisfied:

$$\varepsilon_i \alpha_i \frac{\partial W}{\partial s_i} = n_i.$$

With the assumption  $W(s_i) = \lambda s_i^2/2$ :

$$\lambda \varepsilon_i \alpha_i s_i = n_i. \quad (3)$$

Let us now solve for the entire set of teams. Recall that the ranking is proportional to the competitive level:  $r_i = \frac{c_i}{\sum_j c_j}$ . It follows that:

$$\frac{\partial R}{\partial c_i} = \frac{1}{\sum_j c_j} - \frac{c_i}{(\sum_j c_j)^2}.$$

As a consequence, writing  $C = \sum_j c_j$ , one gets from Equation (1):

$$n_i = \alpha_i \varepsilon_i m_i \left[ \frac{1}{C} - \frac{c_i}{C^2} \right]. \quad (4)$$

It is handy to introduce the notation:

$$\omega_i = \frac{n_i}{m_i \alpha_i \varepsilon_i},$$

and

$$\Omega = \sum_j \omega_j.$$

The equation (4) then can be written:

$$c_i = C - C^2 \omega_i \tag{5}$$

Summing over  $i$  the preceding equation, one obtains  $C^2 \Omega = (k - 1)C$  and thus the remarkable relation:  $C \Omega = (k - 1)$ , which we will write as:

$$C = \frac{k - 1}{\Omega}.$$

Equation (5) then writes:

$$c_i = \frac{k - 1}{\Omega} - \frac{(k - 1)^2}{\Omega^2} \omega_i.$$

Now, using Equation (3) one can compute:

$$s_i = \frac{n_i}{\lambda \alpha_i \varepsilon_i} = \frac{m_i \omega_i}{\lambda}$$

and since  $c_i = s_i + \alpha_i a_i$ :

$$a_i = \frac{c_i - s_i}{\alpha_i}$$

which yields:

$$a_i = \frac{1}{\alpha_i} (C - (C^2 + m_i/\lambda) \omega_i)$$

Then, using  $a_i = \bar{a}_i - \varepsilon_i p_i$ , one finds the equilibrium prices from the formula:

$p_i = \frac{\bar{a}_i - a_i}{\varepsilon_i}$ ; it comes:

$$p_i = \frac{\bar{a}_i}{\varepsilon_i} - \frac{1}{\alpha_i \varepsilon_i} \left( C - (C^2 + \frac{m_i}{\lambda}) \omega_i \right)$$

and, after some simplifications:

$$p_i = \frac{\bar{a}_i}{\varepsilon_i} - \frac{C}{\alpha_i \varepsilon_i} + \frac{C^2 \omega_i}{\alpha_i \varepsilon_i} + \frac{n_i}{\lambda \alpha_i^2 \varepsilon_i^2}$$

from which one finally gets a well-defined value of the ticket price for team  $i$  at equilibrium, as a function of the parameters of the model:

$$p_i = \frac{\bar{a}_i}{\varepsilon_i} - \frac{(k-1)}{\alpha_i \varepsilon_i \sum_i \frac{n_i}{(M+\beta_i)\alpha_i \varepsilon_i}} + \frac{(k-1)^2 n_i}{\alpha_i^2 \varepsilon_i^2 (M+\beta_i) (\sum_i \frac{n_i}{(M+\beta_i)\alpha_i \varepsilon_i})^2} + \frac{n_i}{\lambda \alpha_i^2 \varepsilon_i^2}.$$

Note that having this close-form formula allows easy numerical computation of examples.

We will now check that this value, obtained from the first order condition is really a maximum. With the chosen notation, one can write:

$$\begin{aligned} R(c_i) &= \frac{c_i}{C} \\ \frac{\partial R}{\partial c_i} &= \frac{1}{C} - \frac{c_i}{C^2} \\ \frac{\partial^2 R}{\partial c_i^2} &= \frac{-2}{C^2} + \frac{2c_i}{C^3} \end{aligned}$$

But we know that:

$$\begin{aligned} \frac{\partial \pi_i}{\partial p_i} &= n_i - m_i \alpha_i \varepsilon_i \frac{\partial R}{\partial c_i} \\ \frac{\partial \pi_i}{\partial s_i} &= m_i \frac{\partial R}{\partial c_i} - \lambda s_i \end{aligned}$$

hence:

$$\begin{aligned} \frac{\partial^2 \pi_i}{\partial p_i^2} &= m_i \alpha_i^2 \varepsilon_i^2 \frac{\partial^2 R}{\partial c_i^2} \\ \frac{\partial^2 \pi_i}{\partial p_i \partial s_i} &= -m_i \alpha_i \varepsilon_i \frac{\partial^2 R}{\partial c_i^2} \\ \frac{\partial^2 \pi_i}{\partial s_i^2} &= m_i \frac{\partial^2 R}{\partial c_i^2} - \lambda \end{aligned}$$

Since  $\frac{\partial^2 R}{\partial c_i^2} < 0$  (see the shape of the function  $x \mapsto \frac{x}{x+A}$ ) the two second derivatives are indeed negative. It remains to check the condition on the cross derivative. Using simplified notation one finds that:

$$\left( \frac{\partial^2 \pi_i}{\partial p_i \partial s_i} \right)^2 - \frac{\partial^2 \pi_i}{\partial p_i^2} \frac{\partial^2 \pi_i}{\partial s_i^2} = m_i^2 \alpha_i^2 \varepsilon_i^2 R''^2 - m_i \alpha_i^2 \varepsilon_i^2 R'' (m_i R'' - \lambda) = \lambda m_i \alpha_i^2 \varepsilon_i^2 R'' < 0.$$

The value obtained for  $p_i$  at the non-cooperative equilibrium of the game is indeed the one that maximizes the objective function  $G_i$ .

## 3 Results

### 3.1 To pay the fans?

The optimal ticket pricing strategy is highly dependent on the size of the TV rights windfall. The most salient result is that the optimal price is likely to be zero or negative. In effect, for any team  $i$ :

$$p_i \leq 0 \iff \frac{\bar{a}_i}{\varepsilon_i} + \frac{C^2 \omega_i}{\alpha_i \varepsilon_i} + \frac{n_i}{\lambda \alpha_i^2 \varepsilon_i^2} \leq \frac{C}{\alpha_i \varepsilon_i}$$

which can be re-written as:

$$p_i \leq 0 \iff \alpha_i \bar{a}_i + C^2 \omega_i + \frac{n_i}{\lambda \alpha_i \varepsilon_i} \leq C.$$

Recall that  $\lambda \varepsilon_i \alpha_i s_i = n_i$  and that  $\omega_i = \frac{n_i}{(M + \beta_i) \alpha_i \varepsilon_i}$ ; it follows:

$$p_i \leq 0 \iff \alpha_i \bar{a}_i + s_i + \frac{n_i C^2}{(M + \beta_i) \alpha_i \varepsilon_i} \leq C.$$

Denote  $\bar{c}_i = \alpha_i \bar{a}_i + s_i$  what can be called the competitive potential of team  $i$ , to be compared with its effective level, the previous inequality writes:

$$p_i \leq 0 \iff \bar{c}_i + \frac{n_i C^2}{(M + \beta_i) \alpha_i \varepsilon_i} \leq C$$

Dividing both sides by  $C$ , one gets:

$$p_i \leq 0 \iff \frac{\bar{c}_i}{C} + \frac{n_i C}{(M + \beta_i) \alpha_i \varepsilon_i} \leq 1 \tag{6}$$

The term  $\frac{\bar{c}_i}{C}$  measures the relative competitive potential of team  $i$  in the league. If the sum of this competitive potential with a term that is inversely proportional to the amount of the TV manna<sup>6</sup> does not exceed 1, the price to be charged in the stadium is negative. So Equation (6) highlights the possibility of negative ticket price.

More generally, there is a complex relationship between the amount of the TV rights windfall and the price to be paid by the spectators. But whether it

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<sup>6</sup>The aggregate competitive level  $C$  also depends on  $M$ , but one can show that, everything else being equal,  $C/M$  decreases when  $M$  increases.

is to boost the attractiveness of the TV broadcast or to maximize the twelfth man effect, it may be appropriate to fill the stadium with demonstrative spectators who will create a very lively atmosphere.

The idea of free access to the stadium (or more invitations) is not new. Invitations are regularly used to fill stadiums for games where the home team is playing against a less prestigious opponent (especially if the game is being televised: it is better not to show an almost empty stadium).

The idea of negative pricing is more original. It corresponds to the intuition that a club might have an interest in paying those spectators who are the most demonstrative supporters. These demonstrative supporters or ultras create, in fact, a part of the economic value of the television show. It is therefore economically justified to pay them like any other factor of production.

### 3.2 Competitive equilibrium

Equilibrium simulations can be performed with different values of the parameters. In Table 1, we set up a reference equilibrium situation for which only the values of  $\beta_i$  differ: the teams differ only in the weight they attach to sporting success. In equilibrium, the clubs that are most focused on sporting success have the lowest ticket prices ( $p_i$ ), the highest levels of atmosphere ( $a_i$ ), the best sportsmen ( $r_i$ ), and the highest TV rights ( $d_i$ ). On the other hand, they get the lowest profits ( $\pi_i$ ). This benchmark illustrates the spirit of this model, which uses a rich decision criterion (an objective function that combines profit and the club's sporting success) and explores the contribution of the twelfth man to satisfying this objective.

In Table 2, we vary the value of  $\varepsilon_i$  (the price sensitivity of the supporters) in addition to  $\beta_i$ . We find, in line with intuition, that in the benchmark situation, the clubs that are more committed to profitability are inclined to moderate their ticket prices as soon as spectators are more sensitive to price variations. Even with less emphasis on the benefits of the twelfth man effect, clubs cannot ignore the fact that financial success is a trade-off between maximizing match day revenues and maximizing sporting success, which leads to a greater share of the TV rights windfall.

Table 1: Ligue with 10 teams, benchmark situation. Only  $\beta$  varies.  
 $m_0 = 5$ . For all  $i$ ,  $n_i = 1$ ,  $\lambda_i = 1$ ,  $\alpha_i = 1$  and  $\bar{a}_i = 5$ .

$\varepsilon_i$	$s_i$	$w_i$	$\beta_i$	$m_i$	$r_i$	$d_i$	$a_i$	$p_i$	$\pi_i$	$G_i$
1	1	0.5	14.6	19.6	0.186	0.930	1.968	3.032	3.462	6.179
1	1	0.5	14.2	19.2	0.169	0.846	1.698	3.302	3.648	6.049
1	1	0.5	13.8	18.8	0.151	0.757	1.416	3.584	3.841	5.931
1	1	0.5	13.4	18.4	0.133	0.665	1.122	3.878	4.043	5.825
1	1	0.5	13.0	18.0	0.114	0.569	0.814	4.186	4.254	5.733
1	1	0.5	12.6	17.6	0.094	0.468	0.493	4.507	4.475	5.654
1	1	0.5	12.2	17.2	0.072	0.362	0.157	4.843	4.706	5.590
1	1	0.5	11.8	16.8	0.050	0.252	-0.196	5.196	4.948	5.543
1	1	0.5	11.4	16.4	0.027	0.136	-0.565	5.565	5.201	5.512
1	1	0.5	11.0	16.0	0.003	0.015	-0.953	5.953	5.468	5.500

Table 2: Ligue with 10 teams, on top of  $\beta$ ,  $\varepsilon$  varies too.  
 $m_0 = 5$ . For all  $i$ ,  $n_i = 1$ ,  $\lambda_i = 1$ ,  $\alpha_i = 1$  and  $\bar{a}_i = 5$ .

$\varepsilon_i$	$s_i$	$w_i$	$\beta_i$	$m_i$	$r_i$	$d_i$	$a_i$	$p_i$	$\pi_i$	$G_i$
1.005	0.995	0.495	14.6	19.6	0.167	0.836	1.749	3.235	3.577	6.018
1.010	0.990	0.490	14.2	19.2	0.154	0.771	1.538	3.428	3.708	5.897
1.015	0.985	0.485	13.8	18.8	0.140	0.702	1.317	3.628	3.845	5.782
1.020	0.980	0.481	13.4	18.4	0.126	0.630	1.086	3.837	3.986	5.675
1.025	0.976	0.476	13.0	18.0	0.111	0.555	0.844	4.055	4.133	5.575
1.030	0.971	0.471	12.6	17.6	0.095	0.476	0.590	4.282	4.286	5.485
1.035	0.966	0.467	12.2	17.2	0.079	0.393	0.323	4.519	4.445	5.404
1.040	0.962	0.462	11.8	16.8	0.061	0.306	0.042	4.768	4.611	5.333
1.045	0.957	0.458	11.4	16.4	0.043	0.214	-0.254	5.028	4.784	5.273
1.050	0.952	0.454	11.0	16.0	0.024	0.118	-0.565	5.3	4.965	5.224

## 4 Conclusion

In this paper, we study the decision of a club that maximizes a mixed objective (profitability and sporting success) in terms of the trade-off between maximizing match day revenues by charging a high stadium price and maximizing the support of the most demonstrative fans to increase the number of wins and boost TV rights revenues. We show that competition between such clubs (competitive equilibrium) generates complex effects of with respect to how the amount of TV rights revenue influences the optimal stadium price. Above a certain threshold of TV rights, it may be appropriate for the club to multiply the invitations or even to subsidize the coming of the most demonstrative spectators.

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